THE AMERICAN GAS LIGHT JOURNAL INC.

PUBLISHED WEEKLY, AT No. 42 PINE STREET.

VOLUME CI., No. 19. Whole No. 2,057. | NEW YORK, MONDAY, NOVEMBER 9, 1914. | Subscription, $3 Per Year. $4 Canada, $5 Foreign.

INDEX TO CONTENTS, PAGE 289 . . . . . ADVERTISERS' INDEX, PAGE 18.

LIBRARY OF CONGRESS, NOV 9 1914 SMITHSONIAN DEPOSIT.

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

—•—

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

—•—

ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

LIBRARY OF CONGRESS,
NOV 9 1914
SMITHSONIAN DEPOSIT

THE AMERICAN
GAS LIGHT JOURNAL
INC.

VOL. CI., No. 19. NEW YORK, NOVEMBER 9, 1914. WHOLE No. 2,057.

CONTENTS.

An Asterisk (*) Denotes an Illustrated Article.

Gas Testing Ordinance.—1st Article: The Passing of Luminosity, by Jacques Abady 289
Gas Heating, by O. J. Kuenhold 292
Experiences, by John Clements 294
*The Separation of the Illuminants in Mixed Coal and Water Gas, by G. A. Burrell and I. W. Robertson 295

EDITORIALS—
New Jersey State Gas Association's Successful Fall Meeting 296
Briefly Told 296
Liability for Electrolysis—Advise Them How to Save—Industrial Gas Papers for N. C. G. A. Meeting—The Value of the District Association—Hold Your Appliance Orders for the Convention—Senator Kean Dead.
New Educational Ideals, by Lee Galloway, Ph. D 300
Remarks of Mr. Geo. B. Cortelyou, President of the Consolidated Gas Company, at the Banquet of the American Gas Institute, October 22, 1914 301
NEW METHODS AND APPLIANCES 302
*Fery Gas Calorimeter—Carbon Monoxide and Nitric Oxide from Gas Burners.
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 302
Council Bluffs, Ia., Growth—Service Definitions—Gen. Harries, President—Chester, N. C., Extends Time—Prosperity out West—Mr. Lacombe Resigns—Reading, Pa., Company Buys Land—A Personal—Troy, N. Y., Trustees—Mr. Thormann Transfixed—Philadelphia's Share—Another Old Gas Man Dead—Mr. Carroll Miller Now in Aurora—Gas Street Lamps in Duluth—Riter-Conley Patents—La Junta, Cal., Building—Taunton, Mass., Improvements—Mr. Ernst's Successors—And Other Items.
UTILITIES COMMISSION NEWS 304
Two New Statutes—To Enlarge Commission's Scope—No Charge for Changing Meters—Maine Utilities Act—Utility Commission Busy—Pledged to Utility Commission.
Financial Notes 304
Public Lighting Table for November, 1914..(Advertising Section) 10
Meeting Times of the Various Gas Associations " 23

Gas Testing Ordinance.—1st Article: The Passing of Luminosity.

By JACQUES ABADY, London, England.

For a great many years the supply of gas has been governed by conditions different to those which apply to other monopolies. In other words, gas has been sold by measure and has also been subject to tests for quality. At first sight these conditions might appear to be similar to those which govern commodities sold under Pure Food Acts, but the similarity is only superficial, for such commodities, though sold by measure, are subject to compliance with conditions of quality which are essential to the purchaser. That is to say, if a purchaser buys sugar he requires sugar and not sugar plus sand; if a purchaser buys milk he requires milk and not milk plus water, both of which requirements the Pure Food Acts take care of. On the other hand, the tests applied to ensuring quality of gas (apart from purity tests) have been essentially artificial and different in scope, for it cannot be said that the consumer buys gas because it gives a light of X candles in Y burner, unless it can be said that compliance with this condition means that he obtains thereby a gas of specific quality and suitable to the uses to which it will be put.

The Anachronism of Candle Power.—I think it requires little demonstration to show that a candle power test of gas is unsatisfactory for two reasons. First, because it does not ensure a *specific* quality or show the *real* quality of a gas; second, because a gas complying with a candle power test is more often than not unsuitable for the uses to which the consumer puts it. As to the first point: In order to ascertain the candle power of a gas it is necessary to burn it in a burner, usually of the argand type. It is notorious that in different argand burners one obtains different candle power readings of the same gas, and even though a burner is used in which adjustments are provided, still the quality depends upon the burner or its adjustment and not solely upon the gas. In other words, the candle power of a gas is not in any sense a physical characteristic of the gas and is subject to variations not due to variations in quality but in the vehicle of combustion. It follows that of two gases, the poorer burned in an efficient burner may actually appear to be of better quality (candle power) than the richer burned in a less efficient burner. How the requirements of existing ordinances in respect to test burners vary, may be judged from a perusal of the tables on pages 138–140 of circular 32 (second edition), of the Bureau of Standards, issued by the U. S. A. Department of Commerce, while the State Regulations set out in the same publication disclose a similar multiplicity of test burners.

In England a gas company obtained monopoly rights and powers of breaking up roads, etc., by virtue of private Acts of Parliament or Provisional Orders, either of which constitute a charter or franchise, when settled by committees or passed by Parliament. These charters contain provisions as to testing for quality and these provisions vary enormously, so that the burner used for testing is in some cases inefficient, in other cases efficient, and in still other cases unsuitable to the particular gas made.

It follows from the above remarks that both in the United States and England the quality of gas supply is subject to the capricious intervention of the test burner and that such tests do not, therefore, ensure that the gas shall be of a specific quality.

As evidence (if any is needed) that candle power tests do not show the real quality even of the illuminating power of the gases, I cite some tests put forward by me in 1904 in a lecture before the North of England Gas Managers' Association, which might be briefly described. I took five different qualities of gas, not specially made up, but actually supplied in large areas of supply. I tested these five gases in nine different ways, all representing methods in official use under different private Acts.

The gases tested are set out in Table B. The methods of testing are set out in Table A; the results in Table C. It will be seen that the apparent candle powers vary as follows:

No. A.	15.0 to 18.12	candles, or	3.13 candles.
No. B.	13.4 to 16.75	" or	3.35 "
No. C.	11.1 to 15.35	" or	4.25 "
No. D.	10.7 to 14.9	" or	4.2 "
No. E.	9.45 to 14.64	" or	5.19 "

It may seem like ancient history to refer to these matters, because, no doubt, it would appear that with the extensive use of Dr. Carpenter's No. 2 Metropolitan Test Burner, the burner difficulty is solved, but what I want to make clear is that, even though this burner is used, the quality returned is a measure of the actual luminous capac-

TABLE A.—*Showing different Methods of Testing Gas for Candle Power.*

Method.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.
Standard quality in terms of 5 feet of gas per hour	Candles. 16	Candles. 16	Candles. 14	Candles. 14	Candles. 14	Candles. 14 and 15	Candles. any	Candles. any	Candles. 14
Burner prescribed for use (dimensions of chimneys are all outside measurements)	24 hole "London" argand, with 6 in. by 2 in. chimney.	24 hole "London" argand, with 6 in. by 2 in. chimney.	24-hole "London" argand, with 6 in. by 1¾ in. chimney.	24-hole "London" argand, with 6 in. by 1¾ in. chimney.	"Wands worth" burner (tri-current argand with centre peg) 7 in. by 1¾ in. or 6 in. by 1¾ in. chimney.	15 hole Letheby burner, 7 in. chimney.	24-hole "London" argand, with 6 in. by 2 in. chimney.	24 hole "London" argand, with 6 in. by 2 in. chimney.	24-hole "London" argand, with 6 in. by 2 in. chimney.
Methods of consuming the gas in prescribed burner	Rates adjusted to 5 feet per hour (Gas Works' Clauses Act, 1871).	Burner fixed for 16-candle flame value. Quality is inversely proportional to gas used.	Burner fixed for 16-candle flame value. Quality is inversely proportional to gas used.	Burner fixed for 14-candle flame value. Quality is inversely proportional to gas used.	Rate adjusted to 5 feet per hour.	Rate adjusted to 5 feet per hour.	Flame adjusted to 3 inches. Quality is inversely proportional to gas used.	Flame adjusted to fill chimney, but not to smoke or tail. Quality is inversely proportional to gas used.	May comprise any of methods 1, 2, 7 or 8.

TABLE B.—*Showing Different Kinds of Gas Tested as Tabulated in Table C.*

A.	16 *Candle Gas*, when tested in 24-hole "London" Argand with 6 inch by 2 inch chimney at 16-candle flame value. (Method No. 2.) This gas contains about 20 per cent. of carbureted water gas.
B.	15 *Candle Gas*, when tested in the 15 hole Letheby burner at 5 feet rate. (Method No. 6.) This gas contains about 30 per cent. of carburetted water gas.
C.	14 *Candle Gas*, when tested in the 24-hole "London" Argand (any chimney) at such a rate as to yield maximum light for which burner was designed. (Method No. 9.) This gas contains no carburetted water gas, and is enriched with benzol.
D.	14-*Candle Gas*, when tested in 24-hole "London" Argand, with 6 inch by 1¾ inch chimney, at 16-candle flame value. (Method No. 3.) This gas contains no carburetted water gas.
E.	14-*Candle Gas*, when tested in "Wandsworth" burner at 5 feet rate. (Method No. 5.) This gas contains about 30 per cent. of carburetted water gas.

NOTE.—The reference to "Method No. 2" show which of the methods tabulated in Table A are the standards in force in each district.

TABLE C.—*Showing Results of Testing the Five different Gases (set out in Table B) in the Eight different ways (set out in Table A).*

Kind of Gas (See Table B).	Methods of Testing (See Table A).								Calorific Power in B. T. U. per cubic feet (gross).	Light from Mantle per c. ft. per hour, Candles.	Specific Gravity. Air = 1.
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.			
A (16)	15.63	15.8	15.95	15.0	18.13	15.19	16.66	17.65	608	22.0	0.50
B (15)	13.4	15.0	15.0	14.24	16.75	14.4	15.9	15.9	592	20.0	0.53
C (14)	11.1	13.87	13.73	12 84	15.35	11.92	14.3	14.5	592	19.1	0.41
D (14)	10.7	13.3	13.65	12.7	14.9	11.73	13.56	14.45	576	19.0	0.44
E (14)	9.45	13.47	13.6	12.4	14 5	10.7	13.71	14.64	580	17.2	0.405

ity of a gas plus the method of combustion, and is, therefore, not a measure of the *real* quality of gas.

It should be pointed out that Carpenter's burner governs two of the three air currents, whereas a burner governing all three air currents might conceivably, and would probably, give a different result to Carpenter's, so that it will be seen that the use of this burner does not disturb the position enunciated above.

I wish further to point out that the compliance of a gas with a candle power standard does not even mean that the gas is of a quality suitable for the consumer. As evidence of this, an examination of Table C shows that whereas the candle power quality of the gases tested ranged from 9.45 to 18.13 (or a variation of nearly 100 per cent.), the calorific power, which is a physical characteristic of a gas uninfluenced by outside conditions, shows a variation of only 32 B. T. U. gross or less than 6 per cent.

That the utter uselessness of a candle power test requires demonstrating nowadays may seem strange, but it is necessary to harp upon this aspect, because in England during this very year, although candle power tests have been abandoned in some 20 to 30 new Acts, they are to be continued as non-penal tests side by side with the official penal calorific power tests which Parliament has ordained. Similarly, in the United States, the Bureau of Standards Circular No. 32, has suggested double tests of both candle power and calorific power.

The point I am urging and want to make clear by this article is that the continuance of a candle power test, whether with or without a calorific test, and whether official or non-official, penal or non-penal, is utterly useless and does harm to the development of gas manufacture, and therefore to the interests of the gas consumer. I am not arguing for the moment whether a calorific standard is a proper test of quality or not, what I am inveigh-

ing against is the idea which still lingers, that a candle power test, either by itself or as an addendum to a calorific test, is a protection to the consumer.

I am not unmindful of the flat-flame consumer. In England, during the past Parliamentary session and in connection with the new Acts referred to above, committees have come to the conclusion that at any rate the Argand burner tests can be abolished, and abolished they have been, but it was argued that a number of people use flat flame burners and the candle power non-penal tests, which have still to be continued in conjunction with the penal calorific tests, are to be made with a flat flame burner. I look upon the continuance of these tests—though no candle power is prescribed and no penalty attaches to them—as a moral restriction upon the efforts of the gas makers, and I do not see that they serve any useful purpose to the flat flame consumer. It seems to me that if a person choses to use gas in a manner for which it is unsuitable, that person, and not the gas maker, must take the responsibility. I find an analogy in the matter of flour. Food and Drug Acts see to it that there shall be no adulteration of flour with alum. Alum causes bread made with flour adulterated with it to be white. Some people in making bread may desire to sacrifice quality to appearance. Shall it be said, therefore, that the Food and Drug Acts should be abrogated for the benefit of the small and foolish minority and alum should be allowed to be present in flour? Surely not. Similarly with flat flame burners.

In order to give light when burned in a flat flame burner, gases which burn with a luminous flame (hereinafter termed "Luminous constituents") are necessary. Such constitutents are not only not necessary, but probably undesirable, in gas useful for the purposes to which the bulk of gas supply is applied. It may so happen that with a particular coal the naturally economical gaseous product may contain gases which give a luminous flame upon open combustion; if so, it is a mere accident, and it does not seem to me to be just or consequential that because this may happen, therefore the gas maker shall have placed upon him the obligation of supplying gas of a certain candle power.

I want to make it clear that the mere idea that gas should yield a luminous flame is an anachronism, which should be swept away now that the provision of luminous flames is not the primary purpose for which gas is used. I cannot see that the flat flame consumer would suffer, because considerations of commercial self-protection would cause gas makers to see to it that no part of their trade was lost through the supply of unsuitable gas. It should be remembered that a gas maker has not a monopoly in supplying light, for he is always subject to the benefit and consequence of electricity competition. There is all the difference, however, in impeding the development of economical gas manufacture by imposing as a standard the very quality or characteristic which it is quite evident is the least needed (if needed at all) in modern gas. Now that gas testing ordinances are in the melting pot, gas makers should see to it that they are put in such a position that in laying down plant, and working plant for producing gas, they are no longer troubled by the bug-bear of luminosity. Once this conception becomes fixed and accepted, the whole question of gas manufacture takes a new aspect.

The Change in Conditions.—We have seen that what candle power tests ensure is luminosity and we know these tests were fixed upon at a time when gas was mainly employed in giving light by reason of this same luminosity. It surely only needs an enumeration of present day conditions to demonstrate that the uses of gas are now essentially different and that if we except the few flat flame burners (with whom I have already dealt) luminosity is no longer necessary or desirable. Indeed, the first thing the average consumer does with his gas is to destroy its luminosity by means of his bunsen burners.

We now get light from gas by means of incandescent mantles, and the labor of investigators goes to show that the light efficiency thus obtained does not depend upon and is not influenced in any way by any luminous properties of the gas employed. Not only so, but luminous constituents, if present in large quantities, are positively harmful, causing blackening of mantles. We know that the flame heat produced is what renders the mantle incandescent and gives us light, and that the flame heat depends upon several factors, chiefly heat of combustion and rapidity of combustion, which factors depend upon the calorific power of the gas, the construction of the burner and the pressure and temperature at which combustion of the gas with the necessary air takes place. Among the factors then, which contribute to the modern light-giving properties of gas, luminosity is conspicuous by its absence.

Although the question of heating-stove efficiency has not been as thoroughly investigated, I think it a conservative thing to say that this efficiency depends upon just the same factors as those upon which lighting efficieny depends. I think one might almost go further and say that the presence (for lighting or stove heating) of luminous constituents in a gas, is not only not necessary, but something of a drawback, having regard to the relation between the lighting and heating qualities of such constituents, which has been the subject of careful experiments by Dr. Davidson and others, and having regard also to the relatively large amount of air required for the combustion of such luminous constituents.

Again, the thermal efficiency of a gas engine does not depend upon the presence of "luminous constituents" but upon the calorific power of the gas, not the "net" or the "gross" as we understand these terms, but a half-way value. In any case, calorific value is the principle quality of gas upon which we measure gas-engine efficiency.

Finally, for cooking stoves, the qualities desired are flame heat and heat of combustion, and luminous flames are objectionable because they give rise to surface carbonization, while for water-heating obviously efficiency depends, so far as the gas is concerned, on that quality which is demonstrated by a perfect water heater, viz., a calorimeter in which, of course, neither flame heat nor luminosity have any influence whatever.

It is therefore obvious, or I should say, it is obvious to me, that as the presence of "luminous constituents" as such is no longer necessary, the luminous flame test for the purpose of testing modern gas is an anachronism and the question to be considered is what test, if any, should be installed in its stead.

What Test Should Replace Candle Power?—In order to answer this question satisfactorily, it is necessary to have a clear idea of the object and scope of a statutory test for the quality of gas.

I assume there is no disagreement as to the necessity of ensuring that gas shall be free from what are termed "impurities," because their combustion gives rise to unpleasantness or worse. For this reason this article does not deal with or suggest any alteration in existing tests for gas impurity, sulphur, ammonia, etc.

When one considers the question of quality, however, one is struck with the fact that the true object of such a test is often lost sight of. The object, as I conceive it, is to form the basis of a bargain between the powers granting or acquiesing in a monopoly and those wielding the monopoly, such bargain being expressed in terms of the rate of charge on the one hand and the quality of the supply on the other hand.

If this is anything like an accurate definition it will be obvious that the test, whatever its nature, should be so fixed as to ensure a supply of useful gas to the consumer (I accent the word "useful") and should further be sufficiently elastic or capable of such modification as will enable and encourage the supplier to reduce his cost and his charge per unit of the useful gas.

Now in the light of this submission it will be seen how far short of this ideal the candle power standard falls, how retrogade is the suggestion of continuing candle power test alongside a calorific power test, how illogical is the conception of expressing tests in terms of varying atmosphere pressure or of "elastic cubic foot," and how detrimental to progress is such a suggestion as differentiation between districts where water gas is made and where coal gas is made. I may say, in passing, that it was because these ideas were embodied in Circular No. 32 of the Bureau of Standards that I criticized it in a manner which led to some comment in the columns of the AMERICAN GAS LIGHT JOURNAL.

It has already been pointed out that we are to-day laboring under conditions which are harmful to progress because they have their root-center in the "luminous constituent" conception of 20 years ago. It will, I think, be obvious that to fix any new standard upon the basis of what the calorific power happens to be under the present conditions must be harmful too.

I am going to try and show that a calorific standard, while being far from perfect, is the only possible one under present conditions, but I interpolate the preceding paragraph because I want to show (by what appears to be logic) that if we try to fix the calorific figure by what results we happen to get from gas made under the "luminous constituent" idea, we shall make a grave mistake. A simile may perhaps make this point of view clear. Suppose A has a contract to supply B with white paint, and he supplies white lead paint, which in consequence is heavy, and which for a given number of dollars will cover so many square feet. Be it noted that the weight does not cause the paint to be efficient. Suppose then that A finds that he can supply a paint which for a less number of dollars will

cover the same number of square feet, but it contains no white lead and is consequently lighter. Would B be justified in his own interest from preventing A from supplying this new paint, charging for it by its covering effect, because each gallon weighed less than the white lead paint? Surely not, and surely this is a parallel to the conditions that it is sought to impose upon gas suppliers by either continuing a candle power test or fixing the basis of calorific power upon the existing basis, that is to say the existing "weight per gallon."

Let us, therefore, in seeking our new position, put on one side the existing test conditions and steadfastly look at the existing nature of the demand for gas.

I have said that I think a calorific standard the only possible one under the present conditions, but that it is far from perfect, and I do not wish by this to give the impression that a calorific standard is undesirable in any way, but merely that its choice is not free from some difficulty. It must be remembered that practically all gas is burned in a Bunsen burner with an admixture of air, and it is this fact which gives rise to these difficulties which would otherwise not be present.

The first thing a consumer is entitled to demand is that, having installed apparatus for the consumption of gas, there shall be no alteration in that gas which will affect the efficiency of the apparatus. Now such efficiency depends not only on the calorific power of the gas but also on its gravity, the amount of air required for its combustion and its pressure. If either one of these three factors alters, then the efficiency of the apparatus which is consuming the gas will alter too.

The question to be considered, therefore, is whether the specification of and compliance with a calorific standard of quality of so many B. T. U's carries with it constancy and the above three factors. The answer, I think, is negative and might be somewhat amplified.

First as to gravity; the gas is made up of a number of constituent gases, some of them combustibles, some of them incombustibles or inert gases. The calorific value of the various combustible constituents is not the same. It, therefore, follows that gases of the same calorific power may be produced by various combinations of combustibles with incombustibles, but the gravity will be totally different. It will thus be seen that a calorific standard does not ensure constancy in respect to gravity, or in the amount of air required for combustion. The influence that the gravity plays in the efficiency and the use of gas resides in the fact that as gas in a Bunsen burner issues from a nozzle, the amount passing at a constant pressure in a unit of time will vary if the gravity varies, and from these considerations, it also follows that the amount of air required for combustion will vary as well.

Thus a Bunsen burner may be fed 1 day with gas at 500 B. T. U. gross and give one standard of efficiency, and on the following day may be fed with gas of the same calorific power and give quite a different standard of efficiency.

I know perfectly well that practical considerations of manufacture and the natural commercial instinct of giving satisfaction will ensure that gas of approximately the same composition will be supplied day by day by each gas works, but at the same time I think we should be making a mistake if we overlooked the influence of these possible alterations in composition although the calorific power is not varying.

The third factor, namely, that of pressure, is one which is, of course, capable of control in a very easy way by the consumer, but I mention it here because it has been abundantly demonstrated that a cubic foot of gas is for most purposes of greater value to the consumer if it is utilized at a comparatively high pressure, instead of a comparatively low pressure, and I, therefore, think that the factor of pressure should be taken into consideration when the question of price per unit of useful gas is also taken into consideration.

I am free to admit that, of the factors enumerated, the calorific power is the most important, and I, therefore, think it is quite clear that calorific power is a suitable medium for the expression of quality of gas.

To fix it, however, on the basis of the calorific power produced by gas made under a candle power standard and to overlook all the other factors, would, I feel, be a grave mistake, and I think the whole matter might be summarized by bearing in mind that the ultimate object of the gas maker and maximum benefit to the consumer is that there should be supplied the greatest number of heat units for a dollar.

Anything that in any way hampers or impairs any enterprise or ability in this direction would, I feel, be fatal, and with this object (and this object alone) should the calorific power be fixed.

I shall, in another article, deal with the rationale of calorimetry.

Gas Heating.

[From a paper read before the American Society of Heating and Ventilating Engineers, by O. J. KUENHOLD.]

The scientific design of gas warm air furnaces and hot water boilers is one of growing importance. Each year sees more buildings heated with both natural and manufactured gas. At the present time heating with natural gas is undergoing remarkably rapid extension, but within the next 10 or 20 years manufactured gas will unquestionably make equally rapid strides.

Natural gas has the advantage of lower cost and is used extensively in New York, Pennsylvania, Ohio, Indiana, West Virginia, Kentucky, Oklahoma, Kansas, Arkansas, Missouri and California. The performance of the gas fields has been the subject of much attention. The generally accepted opinion is that the best of them will probably last at least another generation. New fields are also being discovered and developed.

It is producer gas, however, to which gas engineers look for the greatest possibilities in relation to heating buildings.

The logical development in the gas industry is to place the gas producing plants at the coal mines, generate the gas there and transport it to distant cities. This would eliminate the quite considerable expense of handling, storing, transporting, etc., and attending losses, necessary under present methods. Indeed, some gas producer engineers go so far as to say that hoisting the coal from the mine to the surface is unnecessary expense and that the gas producer should be placed in the mine and generate the gas there.

Referring again to illuminating gas as a fuel for heating buildings, there are a number of facts pointing out the probable future development in this direction that are food for thought. City gas has been steadily dropping in price for the past 20 years, while the price of coal has with equal steadiness advanced and will surely continue to do so. Electric illumination is making such inroads into gas lighting sales that the gas companies must develop other fields. Many gas companies offer special rates for gas for heating purposes, and are finding it a profitable venture. A notable example is St. Louis, where about 200 buildings are heated by manufactured gas. People demand comfort, cleanliness and convenience in their homes, and many are willing to pay an increased amount for gas fuel to eliminate coal and its attending evils from their residences. The damage done by coal smoke in cities is realized and steps are being taken to prevent it. New York City has an ordinance permitting only anthracite coal to be used. These few facts show how the cost of heating with coal as compared to manufactured gas is getting closer and closer. In many cases circumstances make gas so much more desirable than coal that coal is out of question. For instance, in private garages, there must be heat to prevent the radiator from freezing; to make starting the engine easy; and for many other reasons. The method of heating must be rapid, convenient, clean, compact, and the heater must be safe when gasolene fumes occur. Gas heat is the solution. In some sections, like Southern California, it is warm during the day but quite chilly at night. To heat with coal requires a fire every morning, and in mild weather coal heating appliances are difficult to control and very inefficient, while gas appliances are highly efficient in comparison. Under such circumstances gas furnaces or boilers are a convenient and economical solution.

In comparing the efficiencies of gas furnaces or boilers with coal furnaces, there is one point which should be noted. Every coal heater has its maximum efficiency at a certain rate of combustion. When this rate is exceeded efficiency drops; and when the rate is less, their standard efficiency falls because of decreased temperature in the combustion chamber. In gas furnaces or boilers where the air supplied is regulated separately to each burner, the efficiency increases with the lower rate of gas combustion. With chimneys of good natural draft, and a well laid out heat distribution, an efficiency of close to 100 per cent. is at times attained. In a climate like Cleveland, the average temperature during the severe months is 38°. The house temperature is therefore raised on an average 32° during two-thirds of the day, and 22° during one-third. The average rate of combustion of fuel is therefore low. This results in lower average efficiency for coal furnaces, and higher average efficiency for gas furnaces than is shown by laboratory tests. Another factor which plays an important part is that in coal furnaces the skill of the operator has much more influence than in gas heaters, so that the laboratory efficiencies of coal heaters are reduced by what may be called a "factor of foolishness."

In estimating gas bills on proposed replacements of coal heaters, the writer submits the following comparative percentages of efficien cies, as giving as accurate results as may be expected under the varied conditions which influence actual results.

With coal at $5.00 per ton, about six million heat units are obtained for a dollar. With natural gas at 30 cents per thousand, only about three and one-third million heat units are obtained for $1.00, and for natural gas to compete with coal it is necessary to obtain a much higher efficiency. Since in using gas all the factors making for higher efficiency are much easier to obtain, natural gas furnaces properly designed can be operated at about the same cost as with coal costing $4.50 to $5.00 per ton, and about 30 per cent. cheaper than anthracite coal at $7.00 per ton.

To illustrate this, assume that for a certain house the coal used during an average winter amounted to 10 tons at $8.00, probably containing 14,500 heat units per pound. At an assumed average furnace efficiency of 50 per cent. (which is high), this would be one hundred and forty-five miliion heat units used all winter. With manufactured gas of 600 B. T. U. at a special rate of 60 cents per thousand, taking 90 per cent. gas furnace efficiency, the house would require 270,000 cu. ft. of gas, which at 60 cents per thousand would cost $162.00, as compared with $80.00 for coal, considering fuel cost only. But to make an accurate comparison other items must be considered. A complete comparison would be about as follows:

Cost Per Year of Heating With Gas.

Fuel used	$162.00

Cost Per Year of Heating With Coal.

Fuel used	$ 80.00
Kindlings	2.00
Hauling ashes	5.00
Damage to house and furnishings by coal and ash dust	30.00
Repairs and cleaning furnace	10.00
Attending labor and inconvenience (seven months at $5.00 per month)	35.00
Total cost	$162.00

It is assumed in the above that the gas furnace is under automatic control.

In order to heat with gas at the high efficiency necessary to compete with coal, the furnace must be designed especially for gas. In fact, for the kind of gas to be used, just the same as a coal furnace should be designed for the kind of coal to be used. Experience in replacing coal furnaces using gas fuel, by furnaces designed especially for gas, shows a saving averaging not less than 33 per cent. and ranging from 20 to 70 per cent.

In approaching the problem of gas heater design it should be borne in mind that two distinct functions are required of the appliance: First, the generation of heat from gas; second, its transmission to the heat conveying medium. By heat conveying medium is meant the air in a warm air furnace, or the water or steam in a boiler.

It is of vital importance that the generation of the heat be entirely completed before its transmission is begun. Both of these functions cannot be efficiently performed at the same time. The usual procedure in constructing gas heating appliances is to install a burner, leaving the proper air supply to chance, and making no effort to maintain a high temperature in the combustion chamber. A burner or group of burners alone, applied to a gas furnace, cannot give the best possible results. A complete system of combustion is necessary. The writer has developed what he calls the "Scientific Combustion System," which will serve to illustrate the principle. In this system two or more oblong burners are set side by side. Above them is a combustion chamber, insulated on all sides to prevent loss of heat. Between the burners are cast iron partition plates extending down to the floor plate about 10 inches below the top of the burners. Each burner, therefore, is in a separate compartment. At the rear of each compartment is a rectangular opening having a shutter pivoted near the center, and the air for combustion is admitted through this. The shutter is connected by a rod to a lever underneath to the gas valve in front of the heater, in such a way that when the gas is turned on to a burner, the air supply shutter of that burner compartment is opened in proportion to the opening of the gas valve.

By this arrangement if one burner is turned on full it will receive the full air supply. If another burner is turned on part way then the air shutter for that burner compartment will be opened only part way. Each burner will always receive only the amount of air required.

To illustrate the advantage of this arrangement, compare it with another furnace. If in the latter, in mild weather, one burner is turned on it will naturally induce a draft. The draft draws air through the heater at those burners not lighted, and this air, not being used, absorbs a considerable portion of the heat generated by the burner in use, cools the inner surface of the furnace and carries this heat up the chimney. In the "scientific system" if one burner is turned on, this burner receives just the amount of air needed and no surplus passes through the heater.

The thorough intermixture of the air and gas is largely a matter of proper proportion of the burner and mixer. The stream of mixed air and gas is broken up into a number of jets. Each jet should issue from a raised stool or nozzle, so arranged that air will be supplied to each separate jet all around. The third essential is that there be a sufficiently high temperature in the combustion chamber to make perfect combustion possible. It is this requirement that is so often violated in the gas furnaces upon the market.

In most gas boilers the bottom of the hollow water sections extend downward into the flame. At first thought one would regard this as a highly desirable arrangement. But let us stop and think what then happens. The bottom of the water section has an average temperature of 150° and the tip of a gas flame about 3,000°.

What actually takes place is this: Whenever the flame comes close to the casting its temperature is reduced below the ignition point and part of the flame extinguished. It is a chemical impossibility for the flame to come into actual contact with a surface colder than the ignition temperature of the flame, and continue to burn. There is also a thin zone around the water section in which, while the temperature of the flame is reduced, the gas is partly consumed to carbon monoxide, a deadly poisonous gas, which causes the peculiar pungent odor which may be noticed in the flue gases when a gas flame is chilled by contact with water coils or castings. The proper way is never to permit a gas flame to come in contact with any surface cooler than itself. If this principle were fully realized, heating with gas would be more popular.

The main idea is this: First get complete combustion. When combustion is complete, but not until then, begin transmitting the heat into the air, water or steam.

The end aimed at is to extract as much heat as possible from the products of combustion, allowing only enough to remain to create a proper draft. The burnt gases in passing through the furnace should be retarded as much as possible, but must travel rapidly enough to leave the combustion chamber as fast as generated, otherwise the flame may be smothered. The draft may be retarded to advantage, much more than in a coal furnace. A sufficient heat transmitting surface is necessary, however. It should be remembered that baffle arrangements, choked off dampers, etc., cannot be made a substitute for heat transmitting surface and proper interior circulation. The length of the travel of combustion products must be much greater in proportion to the cross sectional area, than is the practice in coal furnaces, and the flue passages should be considerably smaller. The vent pipe should preferably be attached at a low point. Hot gases rise, and cooled gases settle. Let them settle down in the interior of the heater first, then carry them to the chimney.

Finally, the direction of travel of the burned gases and of the heated air or water should be in opposite directions. This principle of opposed circulation is of great importance, although not used very much in furnace and boiler designs. To illustrate, let us examine the average gas boiler. The water enters at the bottom and leaves at the top; the products of combustion enter the heating space at the bottom and leave at the top; both travel in the same direction. For highest efficiency the air or water should travel in opposed directions. The exhaust gases should leave the heater at the part where the cold air or water comes in; that is at the part of the heater where they can be cooled to the lowest possible temperature before going to the chimney. The incoming water or air should travel toward the hottest part of the heater and just before it leaves be exposed to the hottest gases as they leave the combustion chamber. With ample heating surface, and observance of the above principles flue gas temperature as low as 100 to 120° can be obtained and an efficiency of close to 90 per cent. Experience also shows that it would be safe to guarantee that the furnace or hot water boiler shall never exhaust the gases to the chimney as high as boiling temperature. In hot water boilers the vent pipe to the chimney will always be at a lower temperature than the outgoing water.

The air or water passing through the furnace or boiler should not be baffled or retarded any more than is absolutely necessary. The

quicker the circulating medium flows through the heater the more heat will it carry away.

From the foregoing it is evident that it is extremely unlikely that a furnace can be designed highly efficient both with coal and gas fuel. The two problems are so different that the furnace must either be primarily a good coal furnace, or else a compromise between the two. Where the highest efficiency is demanded, as in manufactured gas territory, hot water systems and vacuum systems, in which about 8 inches of vacuum may be maintained upon the system at the boiler, give considerably better economy than low pressure steam systems.

Experiences.

[By JOHN CLEMENTS, Experience Editor, Pacific Coast Gas Association.]

While the life of each of us is a succession of experiences, we are prone to believe that most of them are of little or no importunce to anyone but ourselves. Many valuable discoveries and inventions are the result of such experiences. The experience of a man in the study of some subject often causes him to produce something of such great value that the whole of our race is benefitted. In the business in which we are engaged we constantly rely on the experience of others, and we and the concerns with whom we are engaged profit by them. On the other hand, we avoid doing the things that might prove unprofitable. We do work in a certain way and think that we know all there is to hnow about it. To-morrow we meet a man engaged in similar work, and find him doing it in quite a different manner. We recognize at once that his method is better than our own, that he has had more experience, has tried many ways and by such experience has learned the best way. Being a broad-minded man he is willing to impart it to us, that all may profit by it.

Who among you that has attended more than one meeting of the Pacific Coast Gas Association can say that he has not profited by attendance on its annual sessions? Who that does not feel that each year he has come has been a valuable experience? If we review the published proceedings of the Association, we will find many things, which while they are old, yet are new and valuable.

Experience in the Manufacture of Gas.—How prolific of experience is this important part of our business to you who have entered the field within the present decade. The old methods of gas making would no doubt seem crude, and crude they were compared to present day methods. Their crudeness made the product very costly, not only to the gas man, but to the would be consumers, as well. In fact it was so expensive as to often make it prohibitive.

One member writes, "In my first experience I took hold of a small gas works, where the owners had installed two benches, one iron retort in each, and, of course, one fire box under each retort. The stand pipes connected to one hydraulic main, from that to a scrubber, which was filled with old pieces of wood of irregular shapes and sizes laid in as near as possible in checkered form. From the scrubber the gas passed into a small purifier box, which had wooden trays made of pieces of 2 x 2, nailed together at the 4 corners, forming a square of size to fit the box. On these squares were laid ordinary lath, on them we put pure lime, prepared by air slacking. We knew nothing about the cheaper and much better material, composed of wood and iron shavings, etc. If we had known we would have had a hard time securing these things, the only shavings would have been what we might have gotten from the carpenter's jack plane; as for the iron borings, they would have been impossible unless we might have obtained them from a distant city at great expense. There was no planing mills or machine shops driven by the gas engine or electric motor in those days. I write this experience and compare the former conditions with the present. It is now called a gas plant, and the men that work in and about it are called gas engineers. Under the old conditions we were called "gas house terriers." Under the old order we did great work when the daily output was counted by four figures. Now the daily output is never less than six figures, and these multiplied several times. At times of peak load (as the electric men express it) they reach seven figures. The days of the past are not to be ignored, those were the days when the seed was sown. The plant resulted, new slips were transplanted, they have been budded and grafted onto the original stalk with the results I have endeavored to show, and the end is not yet.

Another member writes of some old time experience with meters: "In the days that are gone and now far beyond the memory of many who are now members of the Association, the gas meter was much different from what it is now. In the days I have in mind we had wet meters, both consumers and station meters, and it was necessary to keep a specified amount of water in them to insure proper registration. If too much water, or too little, the meters would register correspondingly fast or slow. Where the winters were extremely cold, the water would freeze, and when the temperature ran high in summer rapid evaporation would take place and cause trouble. In winter alcohol was resorted to; in the summer the water bucket and funnel. Just think what an experience this was."

Is it any wonder that some other type of meter was sought for, and finally found, and so perfected that to-day we have an instrument that is as near accuracy as any other instrument used for the measment of any standard; such as the passing of time, the distance one may travel, the scales that the grocer uses, or the butcher relies upon, and in which the people have faith when he keeps his big fat hand off?

When I review these experiences, and compare with present day conditions, I stand in utter amazement at the strides that have been made. I think of the master minds that have, by inventive genius and hours of untiring labor, been able to bring about such results, and given us the results of their experiences. To such men we owe much. There is one in particular whose memory we revere, that during his life wrought out the very foundation of this great work.

Great, indeed, was the gas man who 50 years ago could say he was sending out 100,000 cubic feet of gas per day. Now there are scores of cities in our beloved United States that count the daily output in millions of cubic feet, and this in the face of our one time so-called enemy—electricity.

Here is an experience of a gas man when attacked by financial electrolysis. He says: "There comes vividly to my mind a promoter that came to the small city where I was engaged in the gas and water business. How he told the people of his wonderful light, of its unseen unknown origin and power. How gas with its frightful odor was destined to become a thing of the past, to be known only as ancient history, a lost art. How my financial associates were impressed by this man's stories. How ruin now stared them in the face. How consumers (good personal friends) came to me and said they had signed up with him and were sorry for me and my company; adding, but you know this will be a much better light and, of course, we must keep up with the times. As I recall, the days and nights looked dark indeed. I talked with and wrote to many of my friends in the gas business, and all of them seemed to be as pessimistic as myself. However, this state of mind was not long to endure, for the gas man woke up; began to bestir himself; he did not as yet begin to think of improving the quality of his light, but rather he looked for a new field for the use of his product. The slogan was, "Gas for Fuel," "Gas for Cooking," and these have continued until to-day, when we find the gross output running up well into billions of cubic feet per day to satisfy the sounding of this slogan.

In the meantime, however, the gas man has not abandoned the illumination field. By the aid of the incandescent gas mantle of Von Welsbach and their application in the gas arc, which far and away exceed the best known electric devices, the gas man and his product to-day stand at the head of their class.

We should not, however, pass this without giving full credit to the appliance man, the manufacturers, inventors, illuminating and heating engineers who have brought out and perfected the many devices which have enabled the gas producer not only to hold his own, but to increase his business and outshine his competitor. This has caused the competitor to search for something that would enable him to cope with gas for brilliant illumination. Even while I write these words the electric illuminating engineers are after you gas appliance men with new devices.

What I have said may or may not be what you expected from me. No doubt you expected individual experiences of members of our association. As I have told you on former occasions, these are hard to obtain because, as before stated, in most instances the member does not consider them of interest to any one but himself. However, I have a few queer ones to relate: A consumer writes that he cannot understand why his gas bill should be so high, and goes on to say that they use gas for cooking and bathing only, and from the condition of the family he thinks the bill should be less and not more. Just what condition this family was in the manager of the gas company was unable to determine. Can you?

Another consumer writes: A man come and fixa de meet so I shall usa de gaz. When dis man he gone I finda he leak all over de base-

ment, dis man he leva de stink. Please you senda de man what fixa. Senda good man so he no leak. No maka de stinka. Please tell him come quick.

Here is a salesman's experience: At this late day is it not strange that in as large a city as ours we should meet with people who know so little about the use of gas. In a recent endeavor to sell a lady a gas range, I was very much surprised that she knew so little, as while talking with her she said: "You know that gas has a very bad smell, and because it has, I am afraid if I used it my pies and bread would be saturated with it. This, of course, would render them unfit to eat." I explained to her how the products of combustion from a coal range passed off through the chimney or flue, and how the gas range was constructed to take care of this, finally making a sale to her. Visiting the house a few weeks later I found her delighted.

Experiences of the Lady Demonstrators.—Sixteen years ago a lady bought a gas range and had it connected up without vent pipe. A neighbor told her she must be sure to place an asbestos mat over the vent opening to keep the heat from passing out and being wasted. In all these years she had never had real satisfaction in the use of her gas range; the invariable result being that everything she tried to bake burned on the bottom and did not brown on top. So they only used the top burners, and for baking used the coal range. Later she heard that other people used gas ranges with great success, and believing that her range was not a good one—not modern, as she expressed it—she concluded she would visit the store with the view to buying a more up-to-date range. While in conversation with the saleslady reference was made to the gas range she owned. She was told that we would be pleased to have a demonstrator call, and I did. The first thing I discovered was the air-bound condition caused by the asbestos plate. Removing it I baked a cake which came out beautifully browned, top, bottom and all round, greatly to the satisfaction of the lady and the demonstrator. It is needless to add, no more coal is used in that house. Moral—It's well to find out, if possible, what your consumers troubles are.

Another lady demonstrator reports a complaint as follows:

"A new range was installed, and after party had tried it about a week she claimed it took 3 days to roast a piece of meat. On investigation it was found that she had been placing the meat on the bottom lining of the oven. When it was explained to her that the proper place to put a roasting pan was on the oven rack, 3 or 4 inches from the bottom, no further trouble was experienced either by the consumer or the company. Moral—If possible have the consumer tell her troubles to you and then do your best to help her out, thus gaining the one thing most desired by gas companies—the satisfied consumer."

The Danger of Gas.—This contributor writes: "A certain restaurant in blank city has blazoned across its front in scarlet letters this statement, "Five thousand doctors condemn gas as unhealthy for cooking." The inference being that this concern uses coal or other solid fuel for cooking. In the window of the restaurant is a large placard with a deep black border and with black letters on a white ground, giving it the appearance of a mourning tablet, and on this card was inscribed in bold headlines, "For the benefit of our late customers, etc."

So it would seem that although gas was not used in the place, they could still recall some customers that "had been, but now were no more." Moral—It is not always safe to eat some cooking no matter what fuel is used in preparing it.

The Separation of the Illuminants in Mixed Coal and Water Gas.

[Prepared by G. A. Burrell and I. W. Robertson, for the Ninth Meeting, American Gas Institute, with the permission of the Director of the Bureau of Mines]

In this paper are shown experiments made by the Bureau of Mines that resulted in separating the illuminants in the artificial gas of Pittsburgh, which is made by mixing 1 part of carburetted water gas with 3 parts of coal gas. The separation was made by fractionally distilling the gas in a vacuum at low temperatures, and follows the method detailed by the Bureau in separating natural gases.

In both the natural gas work and the coal gas work advantage was taken of work on the subject by F. Lebeau and A. Damiens, who separated mixtures of the paraffin hydrocarbons and coal gas by the same method. The Bureau, however, separated the paraffin hydrocarbons into single constituents and found it necessary to refractionate distillates and residues in all cases to obtain pure gases. Further, there is shown in this paper a simple method for the determination of benzene in artificial gas. The principle of the procedure rests on the fact that the gases at different stages in the analysis are subjected to temperatures at which certain constituents can be removed by a mercury pump from certain others which have low vapor tensions at the temperature selected. It was found impossible to make a clean separation in any case at one fractionation, hence distillates and residues were refractionated until the separation was as complete as desired.

The following groups show the constituents of artificial gas that can be separated at different temperatures. The first column shows the distillates that can be obtained at a particular temperature and the second column the residue, *i. e.*, these gases have inappreciable vapor pressures at that temperature:

Temperature of Liquid Air.

Distillates.		Boiling Point °C.	Residue.		Boiling Point °C.
Methane	(CH_4)	—160	Ethane	(C_2H_6)	—93
Nitrogen	(N_2)	—195	Propane	(C_3H_8)	—45
Oxygen	(O_2)	—183	E-butane	(C_4H_{10})	1
Carbon monoxide	(CO)	—193	Iso-butane	(C_4H_{10})	—10
Hydrogen	(H_2)	—253	Ethylene	(C_2H_4)	—103
			Propylene	(C_3H_6)	—51
			Iso-butylene*	(C_4H_8)	—4
			Benzene	(C_6H_6)	80

* The boiling point of N-butylene could not be found in the literature. The N-butylene was not seperated from the iso-butylene. Neither was the N-butane seperated from the iso-butane.

155° C. to 145° C.

Distillates.		Boiling Point. °C.	Residues.		Boiling Point. °C.
Ethylene	(C_2H_4)	—103	Propane	(C_3H_8)	—45
Ethane	(C_2H_4)	— 93	N-butane	(C_4H_{10})	1
			Iso-butane	(C_4H_{10})	—10
			Propylene	(C_3H_6)	—51
			Iso-butylene	(C_4H_8)	— 4
			Benzene	(C_6H_6)	—80

130° C. to 120° C.

Propane	(C_3H_8)	—45	N-butane	(C_4H_{10})	— 1
Propylene	(C_3N_6)	—51	Iso-butane	(C_4H_{10})	—10
			Iso-butylene	(C_4H_8)	— 4
			Benzene	(C_6H_6)	80

78° C.

N-butane	(C_4H_{10})	1	Benzene	(C_6H^6)	80
Iso-butane	(C_4H_{10})	—10			
Iso butylene	(C_4H_8)	— 4			

Composition of the Artificial Gas of Pittsburgh as Analysed by Ordinary Methods. Analysis Made September 1, 1914.

Constituents.		Per Cent
Carbon dioxide	(CO_2)	2.64
Oxygen	(O_2)	0.81
Illuminants		8.67
Carbon monoxide	(CO)	13.34
Hydrogen	(H_2)	37.04
Methane	(CH_4)	30.96
Ethane	(C_2H_6)	1.82
Nitrogen	(N_2)	4.72
Total		100.00

In making the analysis the CO_2 was removed by caustic-potash solution; the oxygen by alkaline pyrogallate; the illuminants by fuming sulphuric acid; the hydrogen by absorption in celloidal-palladium solution; the methane and ethane by slow combustion, and the nitrogen by difference.

The above gas was next subjected to fractional distillation at various low temperatures in the apparatus shown in Fig. 1. *a* is a Dewar flask to hold the refrigerent used in cooling the gases; *b* the bulb in which the gases were cooled; *d* a gas analysis burette, and *c* a container for measuring the gases prior to cooling. *E* is a gage for registering pressures in the Topler pump; *f* a drying tube containing phosphorus pentoxide for removing the water vapor from the gases; *g*, *h* and *i* containers for trapping the gases over mercury as they

(*Continued on page* 298.)

THE AMERICAN GAS LIGHT JOURNAL INC.

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

E. P. CALLENDER, President.
A. M. CALLENDER, Vice-President and Treasurer.
CHARLES H. WADELTON, Secretary and Manager.

SANFORD K. CAMPBELL, Editor.

Agents—American News Co., 11 Park Place, New York City.
Lemcke & Buechner, Berlin, Germany.
Aug. Siegle, 30 Lime Street, London, England.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico, $3 per year. Canada, $4 per year. All other countries, $5 per year.
Single Copies, 10 Cents.

NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, NOVEMBER 9, 1914.

NEW JERSEY STATE GAS ASSOCIATION'S SUCCESSFUL FALL MEETING.

The New Jersey State Gas Association, now in its fourth year, has again demonstrated that meetings every three months, at which special topics are brought up, are much more interesting and profitable than yearly conventions. The Fall meeting, which was held Thursday, November 5th, at Trenton, in the auditorium of the Public Service Gas Company, was a "specialization" meeting and an attendance of 50, or half of the membership, showed that the interest is being kept up by the work of Secretary Potter.

Owing to the delayed arrival of President Butcher, and the fact that Vice President I. W. Peffly is in South America, Mr. S. J. Franklin called the meeting to order at 10:30 and passed over the usual preliminary delays with his "Sir John" smile, and called upon Mr. J. B. Jones, of Bridgeton, for his paper on outdoor lighting.

Outdoor Lighting.

The paper did not include public lighting, being confined to commercial lighting only, and described the results of intensive effort in a town of 12,000. The number of outside arcs in use was over 180, the maintenance charge being $4 per annum against which the costs were found to be $3.20

The discussion started with a whoop, that is to say it was started by Mr. J. P. Conroy, who stated that in a recent compilation it was found that Bridgeton headed the list in outdoor arcs per capita. Mr. C. W. Hoy asked about the statistical application of the original expense of installation, and in true (President) Humphresque manner, wanted to know about obsolescence, inadequacy and decay. This morsel for the auditors was nipped in the bud, as instead of capitalizing the investment they charged it to operating. Mr. Jones said that Bridgeton was surrounded by Millville, and it looks as though it was also surrounded by common sense.

Mr. Pierce claimed that it was good practice to depreciate a rented lamp so that it would be written off in 3 years, but no one seemed to agree with him.

The results recently accomplished at Stapleton, Staten Island, by Mr. Welch, were described by Mr. Barnes, and the sale of 300 outdoor arcs in 3 weeks speaks well for the former's method of specialiazation.

The summing up of Mr. Jones brought the session to a close.

No Entertainment Required.

Instead of a mediocre table d'hote, with speeches for desert, the members went to the several excellent restaurants in the neighhood, and had their luncheons unattached.

Shortly after 2 P.M. President Butcher, who had arrived in the interval, called the afternoon session to order and Mr. E. C. Bartlett, read Mr. Schofield's paper on heating.

Gas Heating.

The possibilities of auxiliary house heating by gas in this climate was treated in a most encouraging and optimistic manner by the author. Wood-burning fireplaces were described as subjects for evening poetry and early morning profanity, while the modern gas fireplace was pictured as being cleanly, odorless, rapid, and nearly as efficient.

In the discussion, Mr. Timm stated that the comparitive effective efficiency of gas *versus* coal was 3 to 1 in favor of coal. Mr. Hoy promulgated a theoretical plan whereby it was proven to be profitable to loan heating appliances, either supplementary or auxilliary, but this plan has not been passed upon by the National Board of Censors as yet. Mr. French told of an experiment where gas-steam radiators were connected to a central plant; also gas fired, and promised to present the figures at the February meeting. He also stated that as far as sales of heating appliances were concerned, the increase in some lines, notably fire-place logs, was 10 times over that of a few years ago.

In the paper the author took a fling at English refractory cone heaters, and the statements as to their efficiency was refuted forcibly by Mr. Pierce. He also called attention to the need of flues to insure healthful conditions with any kind of heating system.

Next Meeting at Glassboro, N. J.

At this point it was voted to hold the next meeting at Glassboro.

Semi-Indirect Lighting.

The final paper of the meeting, on semi-indirect lighting, was read by the author, Mr. J. P. Harlan, who covered briefly the historical side and then by demonstration the practical side. Three types and five styles of semi-indirect fixtures were shown in use, through the co-operation of Bayley & Sons, the Welsbach Company, and the General Gas Light Company. A very handsome newel design of Bayley & Sons was also shown.

The enthusiasm which greeted the speakers during the discussion was evidence of the confidence with which gas lighting is going to be pushed (in some quarters) this year.

Mr. Hamerstrom was the principal whooper and his clarion call should wake even the most somnolent, let alone the diffident gas men.

He was followed by Mr. Barnes, who decried the lack of interest so far taken in good gas fixtures or in the efforts to provide them.

All agreed that the gas fixtures displayed were the best that had been obtainable for years. Owing to the absence of Mr. Grady his paper on "Gas Fuel" was held over until the February meeting.

Upon the suggestion of President Butcher, resolutions were passed and sent to the family of Senator John Kean, of Elizabeth, who died the day previous.

The committee on papers for the next meeting was announced to be Messrs. Will W. Barnes, Chairman; R. F. Pierce and E. C. Bartlett.

Among those in attendance were "Pop" Mason, B. W. Dole, T. J. Litle, Stanley Little, C. W. Wardell, H. W. Plummer, B. Kay Johnson and A. C. M. Azoy.

BRIEFLY TOLD.

Liability for Electrolysis.—St. Paul, Minn., is preparing to make a test case of the damage to its water pipes by electrolysis. In numerous sections of the city water pipes have been damaged by current from the street railway lines, and the traction company has declared that the quality of soil had something to do with the damage and denied liability. It is the theory of the electrical company that in some kinds of soil electrolysis is induced without any connection with currents from street railway lines. A few hundred dollars only is involved in the specific claims of the city against the street railway company, but since damage by electrolysis is not discovered until the pipes are so eaten that they leak, there may be very extensive damage of which the city knows nothing. Mr. Ray Palmer of Chicago, has just finished an examination of the city water mains, and recommends that the city require the traction company to pay for the damage. After payment has been made, he recommends that the city reach an agreement with the traction company to have installed the necessary equipment for a return system, including a pilot wire

and recording instruments sufficent to protect from stray currents all underground metallic structures. He recommends that all rails be carefully bonded and cross bonded, and the city and the company to determine the difference in potential allowable between the rails and pipes and cable sheaths. Special tests should be made at various places to determine the amount of current flowing upon pipes and cable sheaths and the maximum voltage drops between rails and power plants.

This matter is more important to the gas industry at large than to the city of St. Paul and and its water mains, and a court decision assessing the damages against the street railway company would be a helpful procedent.

ADVISE THEM HOW TO SAVE.—It is often necessary to show a consumer that she is wasting gas, and that there is a reason for her bill being larger than that of her neighbor with even a larger family. Here is a letter that appeared in the *Brooklyn Eagle* telling how one woman kept her bill down. Perhaps you could use it.

"With very few exceptions my entire meal is cooked at one time in the gas oven. For breakfast the cereal, hot bread, sausages or chops, all closely covered, are put in at the same time, leaving out coffee to be prepared on a tap burner. A longhandled spoon or fork is used for stirring and testing the contents of the oven. For dinner the roast or stew, potatoes, peeled and cooked with the meat, or baked in their jackets, any other vegetable preferred; also, a pie or pudding. Soup to be heated can be added later. Meat poultry, etc., are covered while roasting, as they then require no basting and are more juicy and tender. This also prevents steam or grease from soiling the oven.

When boiling anything that requires long cooking, I start the article boiling for a short time, turn off the gas and let the contents simmer until cold. Then light the gas again and heat to the boiling point, and turn off gas again until ready for final cooking. This method acts on the principle of a fireless cooker if you always keep the vessel closely covered. Saucepans that come for this purpose may be used to cook several article of food over one burner. Or the regulation kind may be utilized by placing a large dripping pan over the burner and setting saucepans in it with a little water in the dripping pan.

Always keep a vessel of water in the oven while in use. This will keep the contents from burning and when the cooking is finished there will be an extra allowance of hot water for soaking out pots and pans. Food may be kept hot by using a double boiler. Fill the lower part with boiling water, put the food to be kept hot in upper part of boiler and cover tightly. Except when using the oven, burners should not be lighted until the kettle, saucepan, etc., are quite ready to go on. Often the gas is left burning while the kettle is being filled or food is being prepared for cooking. Why use the large burner when a smaller one will do? Or why turn the flame unnecessarily high? The excess of heat is useless, as the flame burns to waste, besides being detrimental to the cooking utensils. The burner should be turned so that a blue flame appears and no yellow tips show. A round flatiron stand over the burner will keep the contents of saucepans from scorching. And always remember that matches are cheaper than gas."

INDUSTRIAL GAS PAPERS FOR N. C. G. A. MEETING.—Industrial gas is to be one of the big features at the coming Minneapolis Convention of the National Commercial Gas Association.

Each year the industrial division assumes greater importance at the convention than during the previous one, and this year particularly there will be a decided increase in the activity of this branch.

Arrangements are being made in the sessions for approximately 300 industrial engineers and workers. These special sessions will be under the direction of the Industrial Committee, and there will likely be a dinner at which the prominent industrial men of the country will speak.

Papers have been prepared by the following members:

A. A. Gindele, Toledo, O. Coffee Roasting or Core and Enamelling Ovens.
F. F. Cauley, Chicago, Ill. Smoke Houses.
C. E. Chapple, Brooklyn, N. Y. Subject to be announced.
Max Rosenberg, New York, N. Y. Stereotype Metal Pots.
E. K. Slater, Newark, N. J. Hotel and Restaurant Ranges. (Mr. Slater will collaborate with Mr. Gillingham in preparing this paper.)
J. F. Reeder, Jersey City, N. J. Steam Boilers.
B. B. Yeomans, Rochester, N. Y. Carbonia Treatment.
W. A. Ehlers, Baltimore, Md. Subject to be announced.

Messrs. F. A. Tuttle, Newark, N. J.; T. M. Ambler, Brooklyn, N.Y.; G. W. McKee, Rockford, Ill. and H. E. G. Watson, Toronto, Canada, have been asked to read papers, and will likely be included in the program to open discussions on special industrial subjects.

THE VALUE OF THE DISTRICT ASSOCIATION.—Mr. Gartley, in his valedictory address to the Institute, spoke of State and District Associations, and the desire of the Institute for affiliation with them. The JOURNAL has always believed that there is a place for the District Association and has endeavored to encourage them, but th ere are one or two that do little more than meet. For instance, is a gas association accomplishing its purpose if it holds but one meeting in a year, at which it devotes a few minutes more than four hours total time to routine business and papers together, out of a three days program. Is not something wrong if the attendance is in the proportion of two appliance men to each gas man? Does either the gas man or the appliance representative get value for the money and time spent in travel and hotel bills and interruption to his work? Would an efficiency engineer recommend such exp enditures? How much that is worth while could you get at such a meeting?

Such things do not merit diecussion, they require correction. We believe there is need for District Associations; work that no other can do so well; but all the smaller associa tions do not justify their continuance.

HOLD YOUR APPLIAMCE ORDERS FOR THE CONVENTION.—There are at leas} two good reasons why intending purchases should hold their orders for appliances and and hand them out to the various exhibitors, during the National Commercial Gas Association show at Minneapolis.

The first and most important reason is that it is the first and only chance you will have to make minute comparisons between all the various makes and styles of any particular appliance; and so gives opportunity to make an understanding selection of the one that best suits the requirements of your company. The second reason is, that, with a generous receipt of orders, the manufacturers will be made to feel that the great effort put forth by them, and the large expense which they have incurred to make the show a success, are fully warranted, and appreciated by those who purchase and distribute appliances.

If you attend the Convention for no other reason than the selecting and ordering of a line of appliances for your company, you can more than save the expense of the trip through the advantages gained by broad comparison and judicious selection for your requirements.

SENATOR KEAN DEAD—Ex-Senator Kean, of New Jersey, died on Nov. 4th, at his country home, Liberty Hall, at Ursino, N. J. after an illness of several months. Mr. John Kean, United States Senator from New Jersey from 1899 to 1911, and a former member of the 48th and 50th Congresses, was born in Ursino, N. J., and was in his 63rd year. He was born where he died, in the home of the Kean family, one of the historic houses of New Jersey, which was buit by Gov. Livingston in 1772. It is on record that George Washington held many conferences with his generals within its walls. Alexander Hamilton studied law there, and it was in this house that John Jay was married to one of the daughters of Gov. Livingston. Senator Kean's city home was at 3 East 56th street, New York.

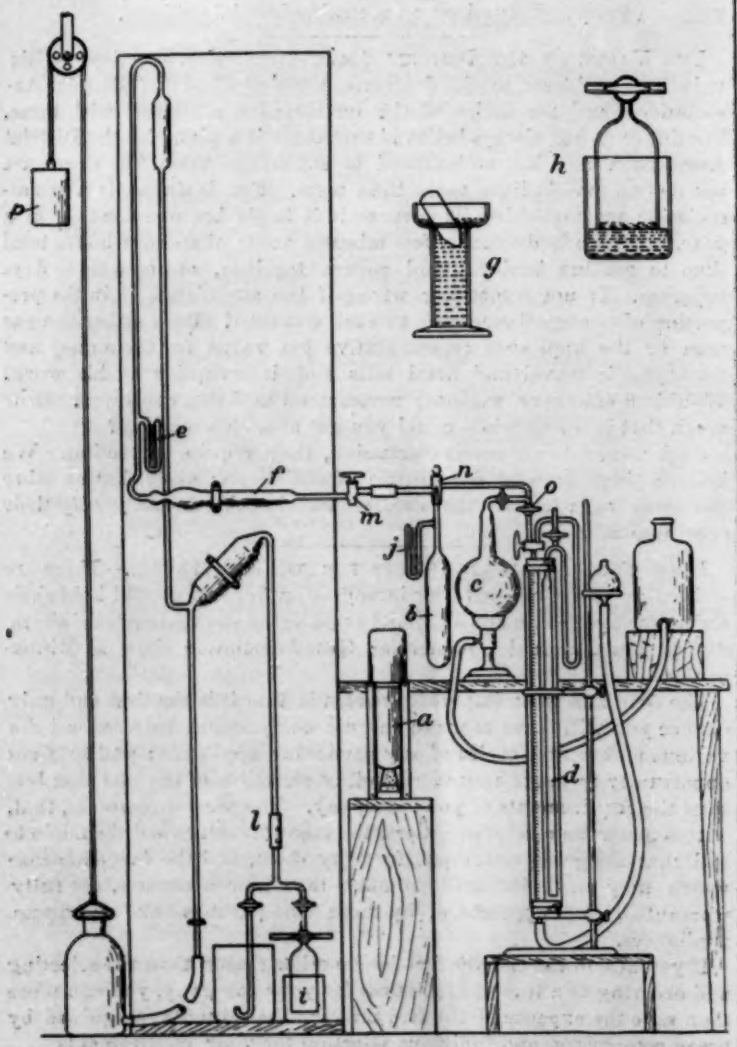
As soon as he was old enough Senator Kean was sent to a boarding school at Stockbridge, Mass., from which he was transferred to a school at Ossining. Here he prepared for Yale, and entered college in 1872, and although he did not graduate, later received the honorary degree of A. M. After leaving Yale he entered the Columbia Law School, and was admitted to the New Jersey bar in 1877. Senator Kean never practiced law, however, and soon turned to banking and manufacturing. He went also into politics and was soon appointed Chairman of the Republican State Committee of New J5rsey. In 1882 he was elected Representative to Congress, and in 1886 was re-elected.

Senator Kean's business interests were large. He was at different times Vice-President of the Manhattan Trust Company, Trustee of the Atlas Insurance Company of London, Directer of the Chicago Junction Railways and the Union Stock Yards Company, Treasurer and a Director of the Pacific Coast Company, Director of the Lawyers' Surety Company, Director of the Standard Rope and Twine Company, Director of the Twin City Rapid Transit Company, Director of the Equitable Securities Company, Director of the North Hudson County Railway, President of the National State Bank of Elizabeth, Director of the Elizabethport Banking Company, and was President and owned the control of the Elizabethtown Gas Company.

He was also a practical farmer, his home estate consisting of 250 acres, which were scientifically farmed. He was one of a family of nine children, of whom only two married, one of his sisters being the wife of W. Emlen Roosevelt.

(*Continued from page 295.*)

FIGURE I.—APPARATUS FOR THE LIQUEFACTION & FRACTIONATION OF GASES,



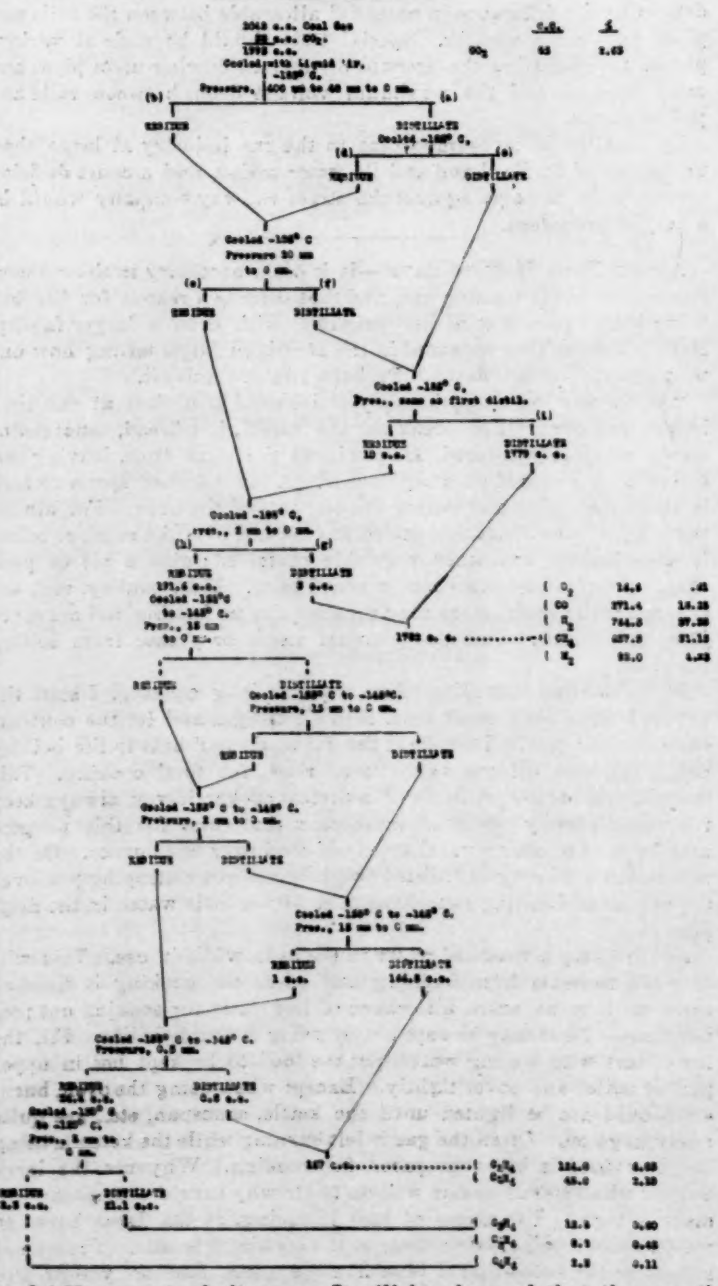
were removed from the pump, *h* and *i* provided with 3-way stopcocks. The particular advantage of containers like *h* and *i* are that they could be filled with mercury by forcing down on them with the stopcock open to the air, finally filling the capillary tube with mercury. The gas from the pump could then be introduced into them by the goose-neck tube attached to *l*, leaving a mercury seal in the capillary tube all the time. *j* is a pressure gage which was of principal use in the benzene determination. *o*, *n* and *m* are 3-way stopcocks. A counterpiece *p* attached to the mercury reservoir of the Topler pump faciliated its working.

First Series of Fractionations.—Figure 2 shows the various steps in the main separation of the gas.

The original volume of sample (2,048 cc.) was freed of carbon dioxide by passing through caustic-potash solution; 53 cc. removed, leaving 1995 cc. The latter was then cooled in the bulb *b*, (about 300 cc. at a time), at the temperature of liquid air. After the introduction of each 300 cc., pumping was started, and as much of the gas removed as possible. There resulted a distillate (a) and a residue (b). Distillate (a) was fractionated at the temperature of liquid air, resulting in fractions (c) and (d). (d) was added to the residue (b) and the total again fractionated at the temperature of liquid air. The distillate (*f*) thus obtained was added to (c), and the total again fractionated at the temperature of liquid air. The residue thus obtained (10 cc.) was added to the residue (c) and the total again fractionated. There resulted a distillate (g) of 3 cc. which was added to the distillate (i) making a total of 1,782 cc. This first series of fractionations show the general procedure. At the temperature adopted, in this case that of liquid air, the gases were repeatedly fractionated until no more distillate of consequence could be obtained. 3 cc., the final distillate, is only about 0.15 per cent. of the original quantity of gas (2,048 cc.). The total distillate obtained was 1,782 cc., and consisted of those gases that have an appreciable vapor tension at that temperature. It consisted of .81 per cent. of oxygen, 13.25 per cent. of carbon monoxide, 37.33 per cent. of hydrogen, 31.13 per cent. of methane,

FIGURE II.

DIAGRAM SHOWING VARIOUS STEPS IN THE FRACTIONATION OF THE COAL GAS OF PITTSBURGH.



and 4.23 per cent. of nitrogen. It will be observed that the quantities of these constituents check very well with the quantities of the same constituents found in the original ordinary analysis of the coal gas. The residue of the first series of fractionations (191 6 cc.) should consist of those gases and vapors that do not have an appreciable vapor pressure at the temperature of liquid air. They are C_3H_8, C_4H_8, C_4H_{10}, C_5H_{12}, C_2H_2, C_4H_6 and C_5H_8; in other words, the so-called illuminants of coal gas with the addition of ethane and probably propane.

Second Series of Fractionations.—The residue (h) (191.6 cc.) was next cooled at temperatures of from —155° to —145° C., and as much gas removed as possible with the mercury pump. Distillates and residues were repeatedly fractionated until there was obtained 167.0 cc. of gas consisting of ethane and etylene. This fraction was analyzed in two ways: (1) by burning the entire fraction with oxygen, and (2) by removing the ethylene with fuming sulphuric acid, and then burning the ethane in oxygen. The data covering these two methods follows:

Analysis of Ethane and Ethylene by Combustion.

	Cc.	Per Cent.
Sample taken	15.12	....
Oxygen added	94.42	....
Total volume	109.54	....
Volume after burning	78.00	....
Contraction produced	31.54	....

	Cc.	Per Cent.
Volume after KOH absorption....	48.27	....
Carbon dioxide produced.....	29.73	....
Ethane.....	....	23.90
Ethylene.....	....	74.40

Analysis by Absorption and Combustion.

Sample taken	34.18	....
After absorption in fusing H_2SO_4.	8.85	....
Absorbed by fuming H_2SO_4.....	25.33	....
Oxygen added.....	76.28	....
Total volume for combustion.....	85.13	....
Volume after burning.....	64.95	....
Contraction....	20.18	....
Volume after KOH absorption....	49.02	....
Carbon dioxide produced by burning	15.93	....
Ethane.....	....	23.3
Ethylene.....	....	74.1

It will be observed that the ethane and ethylene by the two methods check very well, showing that other gases were not present in significant amounts. The percentages found as above were averaged and calculated to percentages of the original gas.

Third Series of Fractionations.—After removal of the ethane and ethylene, there remained 24.4 cc. of gas which was fractionated at temperaturesfrom —130° to —120° C. The distillate, 21.1 cc., was analyzed by burning in oxygen, and measuring the resulting contraction and carbon dioxide, and calculating to propane and propylene. This method does not isolate the gases and hence does not show that other gases than these two were not present. In working on the separation of the paraffin hydrocarbons, however, the Bureau found that propane could be separated from ethane at temperatures between —130° and —120° C. Propylene has a boiling point very close to propane, and the boiling point of ethylene is not far different from that of ethane, hence it is assumed that propylene and ethylene would respond to the same treatment as the propane and ethane.

Fourth Series of Fractionations.—After removing the propylene and propane there remained a residue of 2.3 cc., only 0.11 per cent. of the original 2048.0 cc. This residue was analyzed by burning in oxygen, and the contraction and carbon dioxide calculated to butylene. The observed data follows.

Analysis of Butylene Residue.

	Cc.
Volume taken for analysis.....	2.3
Oxygene added	93.81
Total volume.....	96.11
Volume after burning.....	90.53
Contraction produced.....	5.58
Volume after KCH absorption.....	82.86
Carbon dioxide produced by burning.....	7.67

According to the reaction

$$C_4H_8 + 6O_2 = 4CO_2 + 4H_2O$$

there result 3 volumes contraction and 4 volumes carbon dioxide when butylene reacts with oxygen. The contraction and carbon dioxide observed in the above analysis, 5.58 cc. and 7.67 cc., are almost in the ration of 3 : 4, within the error of making the analysis, hence the data were calculated to butylene. Such a small quantity of gas was available to work upon that there might easily have been a trace of butane present. However, the total quantity compared to the original volume was only 0.11 per cent., or practically insignificant. Benzene that should have appeared in the last fraction did not show up, hence the inference is that in the many transfers of the gas it had condensed in the pump and removed a trace at a time in the other fractions and in sweeping out the pump with air.

The total number of cubic centimeters of gas from the various fractions equals 1782 × 167 × 21.1 × 2.3 = 1972.4 cc., exclusive of the benzene. The benzene found by using a separate portion of the coal gas is 1.33 per cent. of the coal gas. Then 2048 cc. × 1.33 per cent. = 27.2 cc., and 1972.4 cc. + 27.2 cc. = 1999.6 cc., or within about 5.0 cc. of the amount (1995 cc.) that was fractionated. Considering the number of times the different fractions were handled in the analysis, this is not a bad check on the operation.

Determination of Benzene.—For the benzene determination a separate quantity of gas was used, and advantage taken of an apparatus suggested by Dr. C. A. Hulett, Chief Chemist of the Bureau, for the determination of water vapor in air. He suggested that air with its moisture be cooled at the temperature of liquid carbon dioxide, the air then removed with a mercury pump, and the water vapor determined after removing the cooling medium, by measuring its pressure. It was a simple matter to apply this principle to the determination of benzene. The procedure was to free the gas of carbon dioxide and water vapor and introduce it into the liquefaction bulb (*b*) (Fig. 1), cool it at a temperature of 78° C. and remove the gas with the pump. The stopcock (*n*) on the bulb was then closed and the Dewar flask containing the cooling medium removed. The condensed liquid in the bulb was then vaporized and its pressure read on the manometer (*j*) (Fig. 1). This pressure compared to the original pressure of the gas gave the percentage of benzene in the coal gas. The results of two determinations are given:

Results of the Benzene Determination.

Original Pressure of the Gas Mm. of Mercury.	Partial Pressure of the Benzene Vapor. Mm. of Mercury.	Illuminants Fonnd in the Distillate. Percentage of the Total Coal Gas.	Calculation of Benzene.	Percentage of Benzene in the Coal Gas of Pittsburgh.
744	10	7.32	$\frac{10 \times 100}{744}$	1.34
744	9	7.39	$\frac{9 \times 100}{744}$	1.31

The total illuminants in the Pittsburgh gas as found by absorption in fuming sulphuric acid is 8.57 per cent. The distillate from the benzene determination was analyzed by absorbing the remaining illuminants in fuming sulphuric acid. There was removed 7.32 and 7.39 per cent. of the distillates. These amounts when added to the benzene found, 1.31 and 1.34 per cent., equal 8.66 and 8.70 per cent. or almost identical amounts with those of the total illuminants in the coal gas. Benzene reacts with oxygen as follows:

$$C_6H_6 + 7.5\ O_2 = 6CO_2 + 3H_2O.$$

The contraction is 2.5 volumes and the carbon dioxide is 6 volumes. The following data shows the results of analysis of the residual vapor that was held in the liquefaction bulb when the original gas was cooled at 78° C. Before analysis the benzene vapor was diluted with air:

Analysis of Benzene Vapor.

	Cc.
Volume taken for analysis...	28.29
Oxygen added..	51.94
Total volume.....	80.23
Volume after burning.....	75.47
Contraction due to burning.....	4.76
Volume after KCH absorption.....	64.25
Carbon dioxide produced by burning.....	11.42

It will be observed that the ratio between the carbon dioxide and contraction is almost exactly 6 : 2.5, showing that the vapor obtained in the determination was benzene. Traces of other easily condensible vapors may have been present, but apparently in such small quantity as to be negligible. The authors were unable to find the vapor pressure of benzene at 78° C. but apparently it is very small, benzene boiling at 80° C. At 20° C. the tension is 5.76 mm. The authors prepared saturated vapors of benzene by shaking pure benzene with dry air. It was a simple matter to prepare unsaturated vapors of benzene by diluting the saturated vapors with air. The quantity of benzene in the air was checked by combustion analysis. A number of tests were made of the benzene in air by the method just described. It was found that at 98° C. all of the benzene could be separated from the air. Analysis were made of the distillates and residues to make sure that all of the benzene remained in the liquefaction bulb at 78° C. The foregoing method, therefore, seems to be well adapted for the benzene determination. There is needed a mercury pump, a liquefaction bulb, a gas burette for introducing the gases and a Dewar flask for holding the refrigerant. A temperature of 78° C. can easily be obtained by using the liquid carbonic acid sold in tanks. The coal gas does not even have to be measured and its exact value determined. It is sufficent to introduce it into the liquefaction bulb at atmospheric pressure and then to read the barometer.

Complete Analysis of the Artificial Gas of Pittsburgh.—The complete analysis of the gas by the foregoing methods follows:

Constituent.	Formula.	Per Cent.
Carbon dioxide.....	CO_2	2.63
Oxygen.....	O_2	0.81
Carbon monoxide.....	CO	13.25
Hydrogen..	H_2	37.33
Methane	CH_4	31.13

Constituent.	Formula.	Per Cent.
Ethane	C_2H_6	2.10
Propane	C_3H_8	0.43
Ethylene	C_2H_4	6.05
Propylane	C_3H_6	0.60
Butylene	C_4H_8	0.11
Benzene	C_6H_6	1.33
Nitrogen	H_2	4.33
		100.00

In calculating the heating value of artificial gas from the analysis as ordinarily made, the value assigned the illuminants is an approximation, because the constituents are not exactly known. With these data for the Pittsburgh gas, the authors give below a value calculated from the complete analysis.

Constituents.	B. T. U. per Cubic Foot at 0° C. and 760 Mm. Pressure.*	Constituents Present in the Gas.	Heating Value of the Constituents Present.
Ethylene	1,673	0.0605	101.21
Propylene	2,509	0.0050	15.05
Butylene	3,265	0.0011	3.59
Benzene	4,012	0.0133	53.36
Propane	2,654	0.0035	9.29
		0.0844	182.50

*The heating values were calculated from the values given by Thomson.

According to the above calculations the illuminants have a heating value at 0° C. and 760 mm. $\frac{182.50 \times 100}{8.44} = 2{,}162$ B. T. U.'s. The authors have included propane in the illuminants as ordinarily determined by absorption in fuming sulphuric acid because it dissolves to a certain extent in the acid. It was found that the methane and ethane were soluble to a slight extent. Unquestionably propane is much more so because the higher paraffins are more soluble than the lower ones. Excluding propane the heating value of the illuminants becomes $\frac{173.2 \times 100}{8.09} = 2{,}141$ B. T. U.'s per cubic feet.

Additional Details of the Experiment.—Temperatures higher than that of liquid air were obtained by cooling a natural gas condensate. This was obtained from a natural gas gasoline plant by subjecting gas from an oil well to a pressure of 250 pounds and then cooling it to ordinary temperatures. This condensate is known in the natural gas gasoline trade as "wild" gasoline. It contains large quantities of liquid propane and the butanes, especially the latter, and some of the ordinary gasoline constituents—the pentanes, hexanes, etc. Ordinary refinery gasoline, and other substances such as alcohol, ether, methyl and ethyl chloride, jellied so much at low temperatures that they could not be used. In order to obtain a temperature of say —145° C., the condensate was placed in a Dewar flask and stirred with a test tube into which liquid air was run until —145° C. was reached. Upon removal of the test tube containing the liquid air the condensate warmed up slowly, about 5° to 10° C. per hour, thereby affording sufficient time for the withdrawal of the vapors. If the condensate rose to a higher temperature than desired, it was a simple matter to introduce a little more liquid air and cool it.

Temperature measurements were made with two pentane thermometers. They agreed with each other and gave within 1.5° C. the true melting points of chloroform and carbon disulphide, and the sublimation point of liquid carbon dioxide. Fresh liquid air as it usually reached the laboratory from a plant nearby had a temperature of —193° C.

The determination of hydrogen sulphide, acteylene, carbon di-sulphide, ammonia, etc., that may have been in the gas was not attempted.

Future work on the fractionation of artificial illuminating gas will cover the analyses of gas that is used in other cities, and the separation of the illuminants in the coal gas before it is mixed with carburetted water gas, and in oil gas used to enrich water gas.

The Fall River (Mass.) Gas Works Company has asked the city's permission to lay mains as follows: In Oak Grove avenue from a point 500 feet north of Locust street 300 feet northerly; in Wellington street 100 feet easterly from 100 feet westerly from 100 Lindsey street.

New Educational Ideals.

[By Lee Galloway, Ph. D., Director of Educational Courses of the N. C. G. A.]

In the complexity of our modern life and thought we are beset with new purposes and new ideals. We must have new solutions of the great questions of to-day. Our educational ideas are shifting. Science and philosophy have joined hands to proclaim that mental life is not a passive condition but a vital, active process—a continuous development.

The Cultural Fallacy.—Until quite recently, it was believed that cultural studies alone constituted the subjects of education. This undemocratic ideal is being thrown aside. Education began at the top and by slow steps was built from the top down. The earliest schools were the universities. The first vocational education fitted for the priest-ship, for the law, for medicine. In each age the great question "What knowledge is of the most worth?" was answered to fit the times. Not until the last century was it considered necessary to give the masses some sort of education. No doubt they have been greatly enlightened but there is as yet a lack of proper adjustment. The public schools still cater to the idea that cultural studies are of supreme importance and the great mass of pupils leave the schools at about 14 years of age, unprepared in any practical way for wage-earning.

The Self-Made Man Fallacy.—The old idea that the self-made man is a wonderful and effective problem is also being thrown aside. The more "self-made" a person is the less he is able to combine with his associates in giving service to the community. He lacks training and this implies an inability to properly adjust himself to the social and economic environment. A self-made man is somewhat of an economic waste. He usually stops growing where he ought to go on.

Conservation of Human Resources—The Ideal of To-day.—To conserve human power and possibilities we must have something in education besides culture and, on the other hand, we must not let the individual become self-made. If mental life is an active process and a continuous development, to have no mental life means stagnation. Stagnation is waste. If education means adjustment to environment, we must fit the education to the age we live in. It must prepare for life in all its phases. Unskilled labor is waste. In the United States there is a shortage of skilled workmen, and we have had to compete with the trained workers of other countries.

In this day of industrial activity, a course of study and training that really fits into the grooves must include the great phases of economic life in regard to production, distribution, exchange, markets, transportation, etc. Men and women must not only be cultured, but they must be useful. Utility does not conflict with educational ideals. That education is the most complete which gives due prominence to a man's vocation; which makes him a craftsman in his work, whatever his work may be. A craftsman is never finished with learning. He is continually trying to improve himself. He conserves his resources by continual training. With him education is never completed. His ideal is *master* craftsmanship.

The Employer's Point of View.—The employer, as well as the workman, knows that training has a market value. With training comes greater efficiency of labor, and with it increased production. We must remember, however, that success means also the capacity *to think* and *to think independently*. It means common sense; it means initiative in new fields. The more varied the interests, and the greater the observing powers, the less difficult will it be to formulate answers to the eternal questions that arise in business-life and in the trades and professions. Training is of value to the individual workman, but it is also of value to the employer.

Vocational training then is justified in three ways for the employer of labor:

1. Economically it is worth while, because the value of a worker is in direct proportion to his chance to express his own tendencies and abilities.
2. Many people have a lack of knowledge only, with no real lack of ability; and with proper training they may become effective.
3. Those who already show some training and capacity will be raised to higher levels of skill.

A New Opportunity.—The National Commercial Gas Association, acting in line with the new educational ideals, have instituted courses of study which are useful as well as cultural. To give the

employees of gas companies an opportunity to get continuous mental development, they are putting out a new three years' course. All business managers know that there is a great weakness in their forces owing to lack of information and want of active mental exertion. The margin which separates a good worker from a poor one is often very narrow. Perhaps all that was needed in the majority of cases where men have given up their positions and sought new lines of employment, was a willingness to give a little time to a real study of their business. Every day brings new evidence that gas companies realize that inefficiency in the office, in the shop, or on the street, is primarily due to ignorance To prevent the great waste this causes, training is the solution.

Remarks of Mr. Geo. B. Cortelyou, President of the Consolidated Gas Company, at the Banquet of the American Gas Institute, October 22, 1914.

Mr. Toastmaster and Gentlemen: You have asked me to say a few words this evening, and have stipulated that they should relate to the gas industry. Other speakers, I am told, have been informed that they might give full rein to their fancy, it even being permissible for them to indulge in comments of a lighter vein; but I am to be severely technical. A prerogative of the toastmaster, among the many he assumes, is to reach out and draft hard-working citizens to fill places as speakers in the after-dinner program. Once in a while you find that the speaker also assume some prerogatives, when once on his feet, with the toastmaster at his mercy for the time being—to say nothing of his audience—and so turns his remarks that their resemblance to anything technical becomes a mere figment of the imagination.

I used to think I was a newcomer in the gas industry, but I am beginning to feel a little differently about it, partly I suppose because of the insistence with which I am asked to deal with the technical side of the industry. One in my position, however, cannot but feel, at least in one respect, as Sir Isaac Newton is said to have expressed himself toward the end of his eventful life, that in all his researches and discoveries he seemed to himself but as a little child gathering pebbles on the seashore while the great ocean of truth lay undiscovered before him.

Don't expect me to speak to you to-night upon the strictly technical side of our business. Rather permit me to use the occasion for a few suggestions of a general character that may commend themselves to you, or even if they do not at first, may stimulate thought along similar lines. We represent a utility of the first magnitude, technically, commercially, publicly—one of the great industries of the world. In these busy and seething times, will it not be profitable to consider for a moment a few of our experiences in conducting our business? These experiences are not exceptional; they apply to all large business undertakings, and that is why I refer to them. First of all, we have such organizations as the American Gas Institute, because they bring together for conference and consultation, and good fellowship, men engaged in similar lines of activity. If conducted wisely, as this one is, they make for efficiency—efficiency in manufacture and distribution, efficiency in public relations. Efficiency is a much abused word in these days. I think many of us forget in our eagerness to secure it how much of value there is in what I may call the efficiency of simplicity. A name does not make a thing good or bad. We may have a business so conducted that the machinery appears to move smoothly, with results turned out with mathematical precision, and yet below the surface it may be hollow and little more than a beautiful shell. The spirit may have been ground out of it by the very keenness of the edge that you have put upon it. Since I have been back in New York I have had suggestions as to efficiency of management made to me in communications that would have done discredit to a 10-year old lad; or submitted to me in other ways with a crudeness and raggedness that proclaimed the authors to be signally lacking in the quality they would impart to others. This, mind you, from individuals of supposed standing or from organizations claiming to represent the last word in the teaching of efficiency.

I should be sorry, however, if these remarks should be construed as a reflection upon the profession of efficiency engineering. Certainly the world of modern business owes a great deal to that profession. What I have said is intended to apply only to the unfortunately large number of individuals who have gone into the business, after having failed, one would think, at everything else. Efficiency? Yes, we are all seeking it, but it comes not by any royal road, or through the medium of any heaven-born genius. Any scheme of efficiency that takes the heart out of the worker is a sham and a delusion. We must develop the human side as well as the mechanical side—the man and woman as well as the engineer or clerk. Through efficiency we aim at results. There can be results which, while on their face successful, are as shallow as the kind of efficiency that secures them; that look merely to immediate financial gains, or, to go a step further, coupled with financial gains, outward evidences of prosperity—as for instance, a handsome plant, spacious quarters, polished machinery, and all that. But unless you have looked far beyond these things into the public relations of your business, establishing your credit upon firm foundations, dealing with your customers frankly and justly, serving in a whole-souled and broad-minded way all the interests that center around your undertaking, your fine equipment and outward appearance of success are but another shell, and the day comes when it will crumble and fall.

The public is coming to know and understand better many of our great industries. It will not avail for us to scream from the housetops that we are virtuous, but what will count is genuine efficiency of management, frank dealing with the public, and the discharge by managers of great enterprises of those duties of citizenship which so many of us at times are prone to neglect. Efficiency, public service—neither will be secured by a multiplicity of laws or a multiplicity of organizations. We overdo the matter of law-making about one thousand per cent. As to organizations, the proportion is so large I would not undertake to compute it. I believe in organized effort, but I do not believe that where two or three are gathered together it is necessary to have an organization. Every thought that enters into the mind of man seems to be organized now, with a secretary, treasurer, board of directors, an executive committee, and countless subcommittees. As soon as it starts business it begins to circularize the universe, and you and I receive these product of the human intellect, so called, in our morning mail. Blessings upon the head of the man who invented the waste-basket! His birthplace should be found and commemorated, and his statue should adorn the public squares of our principle cities.

Another obstacle in the way of efficiency is the habit we have of wasting our energies on non-essentials. For example, in every community there are people who are not happy unless they are getting up some kind of public celebration. No event in the past is too unimportant to serve as an excuse for an elaborate and costly celebration, with its pageant, parade, banquet, souvenir program, and the like. The private citizen, as well as the city, State or Nation, is solicited to contribute, and cannot well refuse. Often the newspapers get out special editions. Fairs, expositions, anniversaries follow each other in bewildering confusion, and there seems to be no end. Everybody admits that there are certain outstanding events in our history which ought to be commemorated in a fitting manner, but like so many things really commendable in themselves we are tempted to push them to extremes, and thus bring the whole practice into disrepute. I wish we might exercise a little more moderation and restrain in this direction as well as in some others.

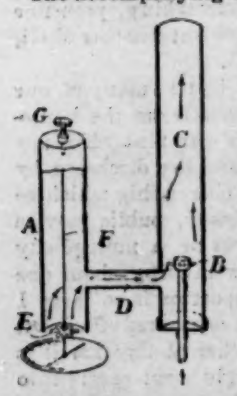
Nor will efficiency or satisfactory results be secured by unwise restrictions which interfere with individual initiative, a tendency which has become too marked in recent times. Much of the legislation of the present day seems to proclaim the doctrine that prosperity must be shackled by a multitude of restrictive laws, rules and regulations; that individual success is a national peril; and that business can be developed, and wealth created by suppression of profits. But the truth is that it was the open field and freedom of individual enterprise that pushed civilization across this continent, built our cities, bound the country together with railroads, and filled the banks and savings institutions with the money of the business men and his employees. Certainly no one would now contend that the abuses which grew up in connection with this wonderful commercial growth should not be removed by the most effective means; only, in removing them, we must guard against an excess of zeal which would subordinate the life of the patient to the success of the operation.

But what a relief it is, when one has such reflections, to turn to an organization like this as one of the exceptions. Founded upon simple lines, conducted with sanity and judgment, helpful to the membership and helpful to the public, consulted alike by those engaged in the industry it represents, and by governmental agencies representative of the public it serves, all who deal with it are assured that its management is an open book and its conclusions, wherever given, the result of honest, painstaking and intelligent effort to make progress along the lines of truth and jusstice.

New Methods and Appliances.

FÉRY GAS CALORIMETER.—A French patent has been taken out by M. Charles Féry on an apparatus for rapidly measuring and recording the calorific power of gas. In principle it consists in determining the heat units given off by the ascensional power communicated to the products of combustion—that is to say, by the draughting up a chimney wherein the combustion of the gas takes place. The draught is made to produce mechanical action, such as the angular deviation of a wire, with a pointer hanging from its lower end, over a dial marked with a scale, or the displacement of a lever with a small counterweight.

The accompanying figure shows one form of the apparatus. *B* is a "rose" burner constructed to avoid the suction produced by a vertical jet of gas. The hot gases ascend in the chimney *C*, producing a draught through the horizontal tube *D*, connected with the vertical tube *A*, which contains the measuring apparatus. The measuring instrument consists of an anemometer *E*, suspended by a torsion wire *F*. The moulinet, with oblique blades working like a screw, does not rotate, but is moved with an angular displacement under the influence of the draught of air when the action is balanced by the torsion wire, and the torsion is manifested by the displacement of the hand on the dial. The wire can be regulated from the outside by means of the knob *G*, and the hand brought back to zero when the instrument is cold.



As soon as the gas is ignited, the moulinet begins to turn, and the hand assumes a position of equilibrium, which measures the velocity of the gaseous current, which is proportional to the calorific power of the gas. The apparatus can be standardized with gas of which this power is known—for example, hydrogen (2,470 calories) or acetylene (13,400 calories). It is advisable to insulate the chimney *C*, to prevent loss of heat; the whole of the calories produced having to be carried forward by the products of combustion.

In measurement of the calorific power of gas, the volume burnt per unit of time should be known. Thus the calorific power can be recorded as a function of time, when care is taken to feed the calorimeter with a constant delivery by means of a regulator. The indicator hands of the measuring instrument can move on a revolving recording drum, and thus the results during a longer or shorter period can be verified.

CARBON MONOXIDE AND NITRIC OXIDE FROM GAS BURNERS.—The *Journal für Gasbeteuchtung* contains a communication by Dr. E. Terres on researches at the Chemical-Technical Institute at Carlsruhe. He has investigated the proportion of carbon monoxide and nitric oxide in the gas flames of lighting and heating burners, with the object of throwing further light on the hygiene of flame methods of lighting. The products of combustion examined included those from inverted and upright incandescent gas burners, the oil lamp and the candle, and gas heating burners. The work on the inverted burner is especially interesting, and it has not hitherto been investigated from this standpoint. The general conclusions at which he arrives are:

1. All flames give a very trifling proportion of carbon monoxide of approximately the same quantity, *viz.*, 0.002 to 0.004 volume of carbon monoxide per volume of carbonic acid. With insufficiency of primary air, this figure may rise to 0.017 to 0.020 volume.

2. All flames likewise give a quite uniform, but trifling proportion of nitric oxide, *viz.*, 0.0006 to 0.0017 volume of nitric oxide per volume of carbonic acid.

3. The products of combustion with town gas containing the usual quantity of sulphur will have 0.00025 to 0.0012 volume of sulphur dioxide per volume of carbonic acid.

The concentration of all these gases, even if the carbonic acid reaches 1 per cent. by volume of the air, is, therefore, far below the limit which authorities on hygiene regard as likely to be injurious to health. Experiments in a room of 1700 cubic feet capacity without special ventilation showed that, owing to natural ventilation, a proportion of 0.5 to 0.75 per cent. of carbonic acid could only rarely be attained in a room lighted by gas.

Items of Interest
FROM VARIOUS LOCALITIES.

THE consumption of gas and electricity in Council Bluffs, Ia., has more than doubled in 7 years, as evidenced by the check from the Citizens Gas and Electric Company for $6,835.81, representing the royalty due the city for the year ending October 1, on the sale of gas and current. The total sales of gas were 119,894,800 cubic feet, on which the city receives 2 cents per 1,000. The check will be deposited to the credit of the city lighting fund and used to lighten the burden of taxation for city lights. The agreement between the city and the company has been in operation since 1907 and the royalties received by the city are as follows:

1907	$3,147.36
1908	3,639.68
1909	4,119.68
1910	4,748.26
1911	5,234.47
1912	5,519.18
1913	6,383.82
1914	6,835.81
Total	$39,608.46

NEEDHAM, MASS., wants gas and the "Chronicle" publishes these definitions of service:

"A gas service is an underground pipe not found in Needham, extending from a main to the house cellar."

"Primary K. W. Hr. is a term used on bills for electricity used for purposes other than lighting, and is particularly familiar to users of electric power in Needham. Its application prevents consumer from receiving reduced rates sooner than the wishes of the company's officials allow."

"Primary K. W. Hrs. equals K. W. Demand X 23. K. W. Demand is a most useful factor to an electric company in charging for power. It may be used advantageously to increase the cost of electric power to a consumer; it is possible to use it to decrease expense to the consumer."

AT a special meeting of the Chester, N. C., council, F. H. Hickok, representing Clawson-Backman of Philadelphia, appeared and asked that the time for the installation of a gas plant, which right had been given his concern, be extended 6 months. Council granted the extension.

GENERAL GEORGE H. HARRIES, a Vice-President of H. M. Byllesby & Company, and President of the Louisville Gas and Electric Company, has been elected President of the Omaha Electric Light and Power Company and assumed the duties of that office at Omaha, October 22nd. General Harries succeeds Fred A. Nash, who has become chairman of the board of directors after 20 years successful direction of the Omaha Company, Mr. Nash resigning the presidency because of ill health. General Harries, while the active head of the Omaha company, will not retire from his connections with the Byllesby interests. H. M. Byllesby & Company are not financially interested in the Omaha Electric Light and Power Company, but have consented to General Harries serving the latter company as described.

THIS comes to us by mail. The following item will, I hope, show you that at least one part of the country is preparing for the wave of prosperity which is just around the corner. It is particularly gratifying, following the "sob" party held in New York last week where pessimism was above par, and optimism was bankrupt: "The Pacific Gas and Electric Co., of San Francisco, have closed a contract with the Sprague Meter Company, of Bridgeport, Conn., for a minimum of 40,000 cast-iron gas meters, to be used in the next two years. It is expected that at least 3,000 of them will be required to take care of gas installations on the grounds of the Panama-Pacific International Exposition."

MR. C. F. LACOMBE, for 11 years in charge of Public Lighting for the City of New York, has resigned. Under his able direction the small, poorly managed, unconnected numerous lighting departments were consolidated and the work placed on a business basis. The improvements in lighting conditions on the streets, and in the public buildings, were as thorough and as well carried out as the changes

in the personnel of the force. All of the open flame gas lamps were changed to the mantle type, and the electric arcs were changed to types of a uniform efficiency. Mr. Lacombe's administration saw the introduction of tungsten lamps and flame arc lamps, but these were only installed where their use was an improvement. His work will not be remembered for the technical papers he has read, as he was retiring as well as untiring. His successor is Mr. David F. Atkins, formerly connected with the United States Treasury Department, New York City.

THE Consumers Gas Company, of Reading, Pa., has acquired the property known as Willow Grove, between the Schuylkill Canal and the river. The tract is called Willow Grove because of the large number of wide-spreading willow trees there, making a park for boating, quoit and other clubs, and runs along the canal and the river. It was to have been part of the city's proposed boulevard system, but the gas company anticipated the public officials and got the property before the city planning commission urged the river boulevard proposition. They will use it for an extension to their plant some time in the future and as space for additional holders. The tract passes and adjoins the land on which the company's South Fifth street river front plant is located.

MR. ROGER P. LOUD has severed his connection with the Citizens' Gas and Electric Company, Nantucket, Mass., of which he has been superintendent for the past two years. During his incumbency, Mr. Loud made many friends, for he readily adapted himself to the local environment. Conscientious and faithful to his duties, he worked steadily for the improvement and development of the local lighting systems, and did good work. As a testimonial of their esteem for Mr. Loud, the employees at the gas and electric plants before his departure presented him with a handsome silver shaving set.

AT the annual meeting of the stockholders of The Troy (N. Y.) Gas Company the following were elected Trustees: Edward Murphy, 2d, Peter McCarthy, James W. Fleming, Alba M. Ide, Frank Gilbert, M. F. Sheary, Thomas Vail, Frederick E. Draper, Robert C. Pruyn, A. E. Bonesteel, James A. Eddy and H. C. Shields.

MR. A. L. THORMANN, two years manager of the gas plant in Waxahachie, Tex., has been appointed manager of the Corpus Christi Gas Company, whose plant has recently been completed at a cost of $250,000 and is now in operation.

PHILADELPHIA'S City Controller has reported that the sale of gas by the United Gas Improvement Company for the quarter ended Sept. 30 was 2,215,630,420 cubic feet, and that under the terms of the lease of the city's gas works there is due the city from the company $439,249,23. The city is now receiving 20 cents per 1,000 cubic feet on all gas sold by the company. Belated collections by the company net the city 10 or 15 per cent., according to terms on which the gas was sold.

RICHARD COYLE, first Superintendent of the Charlestown (Mass.) Gas Company, died recently at his home, 25 Arlington ave., Charlestown, at the age of 93 years. He was born in Ireland and came to this country many years ago. For more than 60 years he had lived in the house where he died. He was the first Superintendent of the Charlestown Gas Company, remaining in charge till 20 years ago, when his brother, Patrick Coyle, succeeded him.

AS Forcasted in the JOURNAL some weeks ago, Mr. Carroll Miller, Engineer of the Providence Gas Company for the past 5 years, severed his connection with that company Nov. 1 to become General Manager of the Western United Gas and Electric Company, with headquarters at Aurora, Ills. Mr. Miller is a director of the American Gas Institute and the New England Association of Gas Engineers, and is the author of many technical papers dealing with gas matters. He is also consulting engineer of the Philadelphia Gas Company of Pittsburgh, Pa. He entered the gas business in 1807, with Humphreys & Glasgow, in London, England. Prior to that time he was for 1 year with the Illinois Steel Co., at South Chicago, Ills. Coming east he went with the United Gas Improvement Co., of Philadelphia, first as assistant superintendent at Fall River, and then superintendent of the Market Street Works at Newark, N. J. Four years later he went to Chicago, opening an office as a consulting engineer. It was while there that he established the Osaka Gas Company of Japan. After 2 years as a consulting engineer in Pittsburgh, Pa., he went with the Providence company.

THE gas street lamps in Duluth, Minn., will not be discontinued. At a conference of the city commissioners it was decided to negotiate for an adequate rental rate with the Welsbach Street Lighting Company. The Welsbach Company had notified Commissioner Merritt that it plans to increase its rates from 93 cents to $1.10 a month for each standard. The Commissioner sought to induce the council to discontinue the gas lamps and substitute incandescent electrics. This plan was opposed on the ground that the city would suffer a reduction in the number of lights.

UNITED STATES DISTRICT JUDGE HOLLISTER, in Cincinnati, has made an entry in the matter of the Hamilton Gas and Electric Company, bankrupt, refering back to Referee H. H. Haines these proceedings with instructions to make further findings of fact as to the dates when the indebtedness of the various creditors, whose claims were approved, were incurred with reference to the time of the issuance of the $300,000 of stock, which is claimed to have been bonus stock, and also to determine what creditors became such after the issuance of the stock without knowledge of the circumstance under which the stock was issued. The referee is to report his conclusions of fact and law in accordance with the opinion of Judge Hollister handed down in this matter some weeks ago.

AN answer to the suit of the Riter-Conley Manufacturing Company, of Pittsburg, Pa., for infringment on a patent gas generator, was filed Saturday in the United States District Court by the Atlanta (Ga.) Gas Light Company, setting forth that it has been using a device patented by Barnum & Carpenter and was unaware of any infringement of Riter-Conley patents.

"P. C.," WRITING from La Junta, Cal., says: It is now given out that La Junta is soon to have a gas plant. It will be remembered that last winter the Rocky Mountain Gas Company secured a franchise to build a gas plant and the mains were to be extended to Rocky Ford for furnishing gas to that city. This company seemed to have some difficulty in getting plans arranged so that they could commence work and the citizens began to lose faith in the project. The franchise has been taken over by other parties largely of La Junta people and they recently let the contract for the construction of the plant to a California concern. It is thought that the actual work in the construction of the plant will be commenced within the next few weeks and in all probability will be ready for service some time early next summer. The contract price, it is understood, is in the neighborhood of $100,000. The franchise held by this company expires in December but if the work on the plant commences before that time it will remain in force and effect. It provides that the plant shall be erected within the corporate limits of La Junta and the pipe lines to extend out from here to supply surrounding towns.

THE Taunton (Mass.) Gas Light Company has begun improvements of its plant which will entail an outlay of more than $200,000. This includes the construction of an auxiliary water gas plant, which can be used when emergency requires, and the laying of a spur track from the New Haven Road to the plant at the Weir. The spur track locations for which have just been approved by the Municipal Council and State Commissioners, is for the shipping of the ammonia product from the plant, a side line that till recently has not been turned to the full commercial abilities. The company is at the highest point of prosperity that it has ever reached and the enlargements are for development that will work toward better service and lower rates.

THE Union Light, Heat and Power Co. and South Covington and Cincinnati Street Railway Co., subsidiaries of Columbia Gas and Electric Co., have filled the positions made vacant by the resignation of James E. Ernst by the election of W. Winans Freeman, of the Columbia Gas and Electric, as president of both companies. Mr. Freeman was succeeded as vice-president of the companies by W. Y. Cartwright. Polk Laffoon, secretary of South Covington and Cincinnati, succeeds Mr. Ernst as director of that corporation, while Albert Silva, secretary of Union Light, Heat and Power, has been elected a director of that company. While Mr. Ernst has been forbidden by his physician from engaging in any active business, his services will be retained in an advisory capacity on his return from Asheville.

Utilities Commission News.

TWO NEW STATUTES.—Two new statutes affecting public service corporations were written into the laws of Arkansas at the September election, when the people approved a measure providing for a stringent child labor law, and one requiring publication of all general orders of the railroad commission, county commissioners of accounts and the general enactments of the legislature. Both measures were initiated by the people.

An amendment to the constitution to permit cities and towns to issue improvement bonds got a majority of the votes cast on the subject, but may not become a part of the constitution because of its failure to receive a majority of the total number of votes cast at the election. The matter will be determined by the Supreme Court.

TO ENLARGE COMMISSION'S SCOPE.—Among the important measures to be considered by the Michigan legislature during the next session will be a bill enlarging the scope of the state railroad commission, and possibly changing it into a public utilities commission. At present the commission has jurisdiction over railroads, telephone companies and power companies, but in many respects the powers of this board are limited. It is known that a bill will be presented at the next session that will place municipal and private owned heating and lighting plants under the jurisdiction of the commission and permit the state board to regulate telegraph rates. At present the commission has no supervision over gas companies except as to the issuance of bonds, and it has been unable to entertain complaints made by patrons of gas companies relative to overcharging, etc. Commissioner Glasgow says the arbitrary and unreasonable tactics of some companies bring public service corporations into disrepute. For instance, he says, a gas company is entitled to demand a deposit for the use of a meter in order to be certain that the patron is acting in good faith. "I believe that it is proper for gas and electric companies to demand a deposit of $5 to cover the initial expense of installing a meter, but this amount should be returned to the customer at the end of six months or a year at the latest," said he. "A gas company has no right to use the people's money permanently for working capital."

NO CHARGE FOR CHANGING METERS.—The First District New York Public Service Commission has directed the Northern Union Gas Company and the Central Union Gas Company to discontinue the practice of making a charge of $2 for changing prepayment meters to ordinary meters.

The Northern Union Company has 55,000 meters, of which 20,000 are prepayment, while the Central Union Company has about 100,000 meters, of which 40,000 are prepayment meters. It is said that there are about ten times as many applications to change from black meters to prepayment meters as there are to change from prepayment meters to black meters. The Commission held that to make a charge for changing meters was in violation of the law.

MAINE UTILITIES ACT.—The public utilities act passed by the last Maine Legislature, was adopted by a referendum vote of nearly two to one, at the recent State election. The act creates a commission to control all public utilities of the State, to take the place of the present railroad commission.

This law was passed in 1913 and would have gone into effect on July 12 of that year but for the fact that a petition was presented calling for a referendum. The statute is Chapter 129 of 1913. The law contains in general all of the stringent and sweeping provisions which have been embodied in recent State statutes of this kind, such as Massachusetts and West Virginia. The salary of the chairman is to be $5,000 a year, and of the other commissions $4,500 each.

UTILITY COMMISSION BUSY.—The Public Utility Commission of Illinois, in a report submitted to Governor Dunne, shows that it has earned $32,000 since January 1. It operates under a separate appropriation of $60,000 and an additional sum of $40,000 left over from the railroad and warehouse commission funds. The revenues of the commission are received from the taxes on the issuance of railroad and utility securities and from fees for inspections.

PLEDGED TO UTILITY COMMISSION.—That Wyoming will become one of the States which undertake the regulation of public utilities through a State commission is forecast by the platforms of the Republican, Progressive and Democratic parties, all of which have pledged their candidates for the legislature to the enactment of a public utilities commission law. Several times heretofore efforts to get a public utilities commission law through the Wyoming legislature have failed.

Financial Notes.

THE Northumberland County Gas and Electric Company, with headquarters in Sunbury, Pa., has been granted permission by the Public Service Commission at Harrisburg, Pa., to make an increase in their capital stock from $700,000 to $1,000,000.

EARNING statement of Pacific Gas and Electric Company for September, coming closely after the announcement that the company would at once retire $2,500,000 of its $7,000,000 short-time notes outstanding, produced a favorable impression regarding the securities of the company. The September statement showed a good gain in gross, and because of reduced operating costs a much larger gain in net.

THE Consolidated Gas Company of New York declared the quar terly dividend of 1¼ per cent., payable December 15, to stock of record November 12.

THE regular quarterly dividend (seventh quarter) of 1¾ per cent. has been declared on the preferred stock of The J. G. White Management Corporation, payable December 1, 1914, to stockholders of record November 18, 1914.

THE Denver Gas and Electric Light Company, for the year ended September 30, 1914, reports gross earnings of $3,160,857, with operat ing expenses and taxes of $1,752,306 and net earnings of $1,408,551. That the company made good progress, despite some unfavorable conditions in its territory in the last year, is show n by the fact that net earnings for the year were in excess of $38,000 higher than for the preceding year.

THE Laclede Gas Light Company issued its report for the 9 months ended Sept. 30, showing gross earnings of $3,388,500, an increase of $89,900. Net income for the period was $1,692,691, an increase of $9,529 over the corresponding period of last year. Net earnings available for the common stock were $563,905, a decrease of $40,479.

THE Standard Gas and Electric Company has already paid off and retired $250,000 of an issue of $500,000 trust notes maturing June 1, 1915.

THE Indiana Public Service Commission has authorized the Citizens Gas Company to issue $200,(00 of 1-year notes, bearing 6 per cent. interest, the issue to be sold at not less than 98 per cent. of par. The notes are to be secured by an issue of $414,000 of 5 per cent. first mortgage bonds, authorized in the same order, the bonds to be issued for collateral purposes only and not to be sold. The bonds represent $248,000 expended on account of additional working capital and $166,000 of plant expenditures.

AUTHORITY to issue at par $84,000 last mortgage, 6 per cent. 30-year bonds and $82,000 common stock has been granted the Ohio Gas, Light and Coke Company, of Toledo, by the Ohio Utilities Commission. The proceeds are to be used to pay for the property of the Bryan & Montpelier Gas Company, $146,956.22; for an unpaid balance of $122.99 on the property of the Napoleon & Wauseon Gas Company; for improvements made by the last named company after the date on which it gave an option to the Ohio Gas, Light and Coke Company to the day the property was taken over, $15,398.26, and for carrying working supplies $7,422.53. The commission cut down the amounts asked for to the extent of $7,000 worth of bonds and $10,000 in stock. The reductions were effected in the amounts asked for the property of the Bryan & Montpelier Company ($3,900) and for the amount asked for stock supply ($13,900).

IT is reported that the Canton (Ills.) Gas and Electric Company has purchased the Lewistown electric plant and will take possession at once. The news is said to have been contained in a letter from the Westinghouse company to a Lewistown correspondent.

GENERALLY speaking the dislocation of the machinery of international finance has not necessitated a change in the method of paying dividends to the foreign holders of American stocks. Corporations which have been in the habit of paying dividends to foreigners by checks in American dollars continue to do so, including the American Car & Foundry Company, Lehigh Valley Railroad, American Beet Sugar Company, International Nickel Company, and the Consolidated Gas, Electric Light & Power Company, of Baltimore. To a very important extent foreign owners of American stocks collect dividends by proxy. They appoint agents or attorneys in this country for that purpose, and checks are sent to them.